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Volume 12
Number 1

The Spanish Afforestation Program *3*
FAO Secretariat

Utilization of Structural Wood in Housing *9*
J. Westoby

Problems of Europe's Small Woodlands *20*
T. François

Shootborers of the Meliaceae *30*
FAO Staff

Commodity Report *32*
Sawn Softwood

The Work of FAO *39*
Ninth Session of the FAO Conference, 1957

Equipment Section *43*

News of the World *46*

Book Notices *51*

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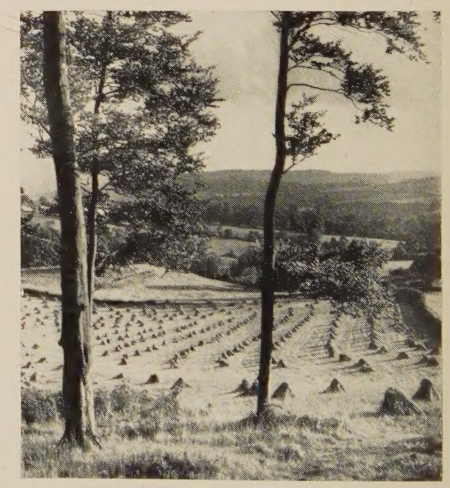


Cover Photograph: *Small woodlands intermingled with fields and cultivation are typical of the landscape of many European countries, as in this scene in the Cotswold Hills in England. The development of small woodlands should go hand in hand with agriculture. At present, extraordinary expenses or heavy investment in agriculture are all too often met by overcutting woodlands.*

Courtesy, J. Allan Cash

Unasylva

An International Review of Forestry and Forest Products

MEDITERRANEAN DEVELOPMENT PROJECT

Soon after the arrival in Rome of Mr. B. R. Sen as Director-General of FAO, just over a year ago, the Director of the Forestry Division and Mr. Gunnar Myrdal, then Executive Secretary of the United Nations Economic Commission for Europe, drew his attention to certain recommendations made by FAO's Mediterranean Forestry Subcommission in the light of experience gained in ECE's Survey of Southern Europe. These recommendations called for a fundamental study of the possibilities and limits of restoring the forest cover to those enormous land areas all around the Mediterranean which have become and remain denuded and practically unproductive.

The Director-General regarded this as a challenging idea.

It soon became clear, however, that a successful program would require a newer and broader approach, and that piecemeal attempts at development in each sector separately, as seemed to have prevailed hitherto, would not achieve the purpose. In order to succeed, plans would be required based on the closest possible co-ordination between a variety of measures affecting reforestation, crop production and grazing, and properly related to basic policies concerning employment, transport development, water utilization, and so forth.

These, however, were generalizations which left many questions unanswered. This was the reason for deciding last April to undertake a preliminary exploration of the whole problem, so as to obtain a clearer idea of its real nature before deciding whether, and in what form, further action should be taken.

The result of this exploration was a comprehensive report entitled *Mediterranean Forestry Programs in relation to Agricultural Rehabilitation and General Development*, which was submitted to the Ninth Session of the Conference of FAO in November 1957.

This interim report did not claim to give all the answers, nor was it expected that all its suggestions should be retained since further investigation might lead to a revision of ideas. Also, the short time available made it impossible to prepare a really satisfactory document giving figures properly cross-checked and reasonably complete. The immediate purpose of the report was to provide an analysis of the information already available on some of the countries of the region, to indicate the gaps which would have to be filled before proceeding further, and to outline some tentative conclusions which could be drawn from that analysis.

The interim report was based primarily on four country studies relating to Iraq, Syria, Greece and Spain, compiled solely by the Secretariat and not reviewed or endorsed by the governments concerned. In these country studies, an over-all survey was attempted of the available physical, human and financial resources, of the recent rate of progress, and of the degree to which land, manpower and even industrial capacity appeared to be less than fully used.

The lessons learned from the study of these four countries were then pooled with more general information collected meanwhile with regard to all the countries bordering the Mediterranean region, and particularly for the eastern countries of that region.

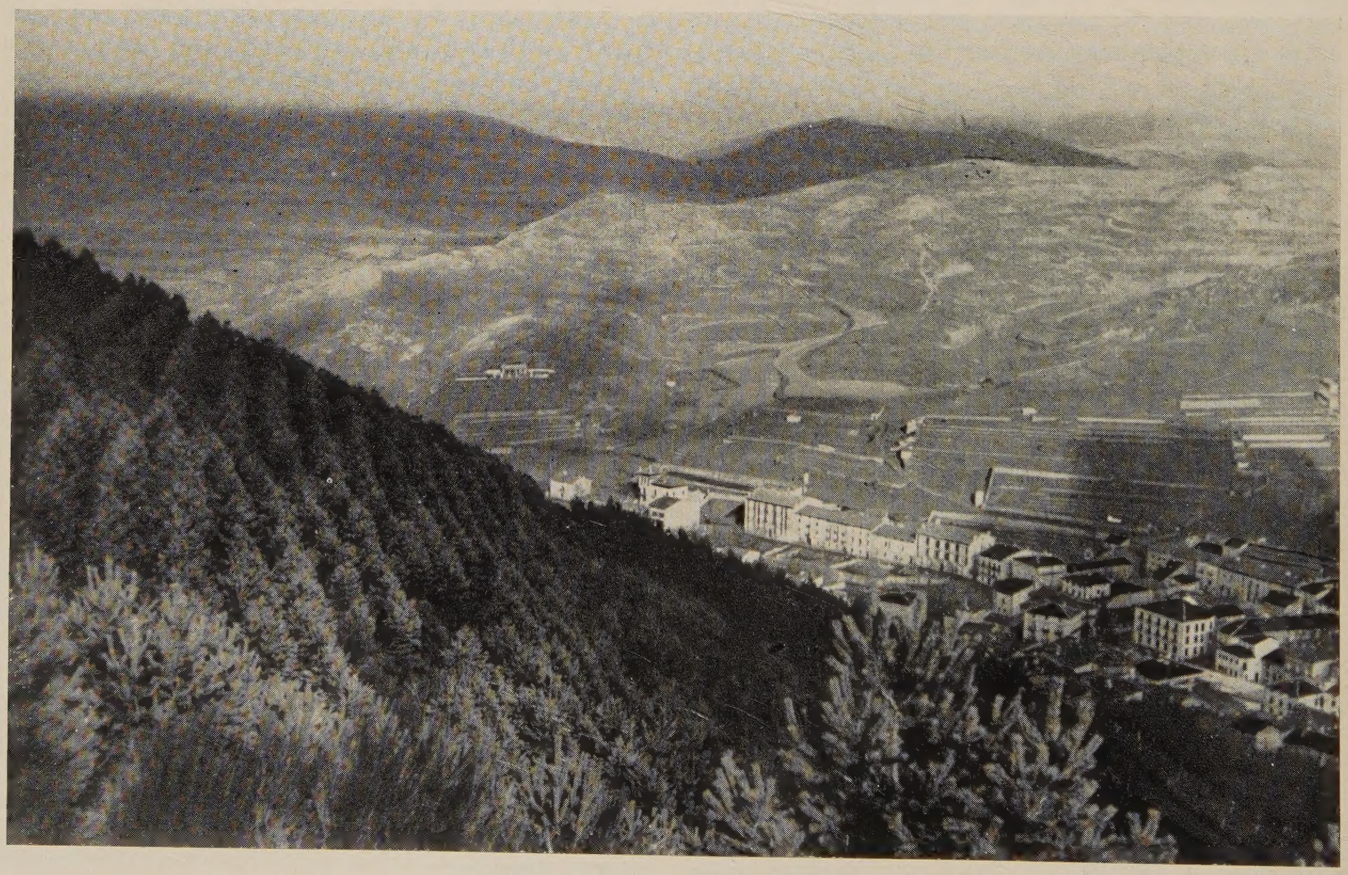
Discussion of this report by the Conference, to which reference is made elsewhere in this issue, revealed general agreement about the importance of a broad and bold attack on Mediterranean agriculture and forestry, and the Director-General was authorized to proceed with a Mediterranean Development Project in 1958 and 1959. The Director-General insisted that " this project will not result in producing just *another* study... our most immediate aim is to produce plans for action for each participating country, but after as careful a study as circumstances permit ".

The aim of this project will be to help countries in the Mediterranean area to develop their forestry and other land and water resources at an accelerated pace in order to contribute to their general economic and social development. The emphasis will be on programs in the fields of forestry, pasture, water development and related agriculture improvements. Not only technical aspects will be dealt with but also the cost of the necessary investments and the prospective benefits, and the steps to be taken for implementation. The question of how the necessary investments could be financed and what complementary measures are needed in the field of economic and financial policy, must also be studied.

The degree of consideration to be given to such aspects as lie beyond FAO's recognized field of competence will depend, first, on the desire of the countries concerned to see these aspects treated, and second, upon FAO's ability to enlist the active co-operation of other United Nations Agencies.

Two successive stages of afforestation work on terraces directly sown with Scotch pine, in the province of Burgos, Spain.

Courtesy, Spanish Ministry of Agriculture



The Spanish Afforestation Program

FAO Secretariat

Like most other countries of the Mediterranean region, Spain is sparsely wooded, even though a forest area of 25 million hectares is quoted by official statistics. Of these 25 million hectares, 10 million are treeless "maquis", grazing lands or pastures, 10 million are park-forests or more or less degraded forests, and only 4.5 million are considered well-stocked forests. The actual forested area in Spain is therefore only slightly higher than one third of that which is officially recorded, and does not even reach one tenth of the total area of the country.

It was not until the middle of the nineteenth century, when the Forestry School and the Forest Administration were founded, that the progressive destruction of forest resources began to be checked, and that serious attention began to be given to their restoration. Since the reforestation law of 1867, a great many legal dispositions have been passed in order to stimulate private owners to co-operate with the State in carrying out afforestation, but this legislation was only successful in limited zones in the north of Spain. Similarly, the hydrological forestry divisions created in 1888 for the afforestation of watersheds contributed little towards an overall reforestation program, although there were some outstanding isolated achievements.

A dynamic forest policy was only formulated in Spain after 1940; at that time, because of the shortage of foreign exchange, timber imports, which in 1936 amounted to 600,000 cubic meters, were practically halted, and the Forestry Administration had to face heavier demands on already impoverished national forestry stocks. To prevent a further deterioration of the situation, the State Forestry Resources Law was passed in 1941, establishing a new body, the *Patrimonio Nacional del Estado*, for the purpose of restoring, conserving and increasing such resources.

Similarly, the elaboration of plans for the erection of new dams for irrigation, for electric power and water supply, showed clearly the need for erosion and flood control. Due to the intricate orography of the country, every Spanish river is, in fact, a true torrent, with an extremely variable flow.[1] This torrential character of the Spanish rivers has always caused great damage.[2]

A law was passed in 1951 for the compulsory afforestation of the watersheds feeding regulative reservoirs.

Another law was passed in 1952 for assistance to free private enterprise for afforestation which was designed to complement State action by enrolling private interests in the work of reforestation, through a system of grants and loans; this particular law also had some social objectives.

Thus, these three laws aim at:

1. Establishment of a solid forest reserve able to supply a steady volume of industrial timber.
2. Erosion control.
3. Creation of a "peasant" forest economy closely integrated with farming, whose immediate objective is to be the provision of domestic timber requirements.

They constitute the framework within which the present Spanish afforestation program is being developed.

Execution of the Program

The Spanish Administration has never formally stated the ultimate targets of the afforestation program. The size of the undertaking to be faced by the State made it almost irrelevant, in the opinion of Spanish foresters, to fix *a priori* the targets of the plan. In the absence of a general development program, where targets for different sectors of the economy were fixed, the Forest Administration, fully aware of the difficulties involved in implementing a large-scale program, was much more concerned at the outset with fixing annual targets and speeding up the initiation of the work, and did not spend much time on long-term planning. Although it is possible to point out the flaw in this attitude (as has been done by some Spanish foresters), it did contribute to an awakening of a general interest in forestry.

It was only recently, once the difficult initial stages had been overcome and some valuable experience obtained, that a total figure of 5 million hectares to be afforested was suggested by the Administration, but this target has not been related to the investment possibilities of the country and has not been fixed in time. This figure represents about 50 percent of the mountain areas, at present entirely devoid of trees, which is left uncultivated and used for more or less extensive grazing. In this connection, the Spanish Administration is convinced that improvement of one third of the grazing land will still allow livestock output to be maintained at present levels, even if the other two thirds of the total area are planted to trees.

[1] The flow of the Guadalquivir river varies between 8 cubic meters per second and 11,000 cubic meters per second; that of the Segura river varies between 6 and 2,000 cubic meters per second, and this variation is not much less in the majority of Spanish rivers. It is therefore necessary to construct extremely large and expensive dams.

[2] The example of the large San Antonio-Tremp dam can be selected. The capacity of this dam (220 million cubic meters) has been reduced by 25 percent over 25 years, which supposes a loss of 16,000,000 Kw-hours per year, besides the loss of 800 cubic meters of soil/km²/year.

These afforestation schemes are not designed to entail any reduction in the cultivated area, since the opinion prevails that any further expansion of the tilled area in Spain is not admissible [3]. If the target quoted is reached, the whole structure of present Spanish forest economy can be completely transformed, as will be pointed out later; in fact, Spain should change to the position of a country almost self-supporting in timber.

Area completed

The area afforested since 1940 is shown in Table 1:

TABLE 1. – AREA AFFORESTED IN SPAIN SINCE 1940

Year	By the Division of Forests and Forestry Planning	By the Division of State Forestry Resources	Yearly total
	..... *in hectares*		
1939–40	—	792	792
1941	3 000	7 485	10 485
1942	3 300	16 718	20 018
1943	4 500	26 341	30 841
1944	6 700	30 714	37 414
1945	5 151	43 682	48 833
1946	4 572	47 916	52 488
1947	5 588	33 551	39 139
1948	10 812	33 342	44 154
1949	9 841	34 130	43 971
1950	8 032	30 301	38 344
1951	11 062	34 728	45 790
1952	9 267	63 518	72 785
1953	12 053	99 835	111 888
1954	23 581	85 225	108 806
1955	12 300	115 118	127 418
1956	28 000	103 305	131 305
TOTALS	157 759	806 701	964 471

NOTE: These figures do not include planting by private enterprise or without State aid.

The Table gives evidence of the great efforts made. It also illustrates clearly the fact that a figure of 50,000 hectares was only reached after 5 years, and that a steadily increasing rhythm of work was only possible after 10 years. A total of about 1 million hectares has therefore been afforested up to date, and hence only 20 percent of the technical program has so far been fulfilled.

The bulk of this work has been carried out on State or municipally-owned lands, between 1940 and 1953. In this connection, the State has increased its land property by more than 75 percent since 1940, bringing the figure for State-owned lands, afforested or not, to 536,000 hectares. This policy seems to be a constant feature of the Forestry Administration after the Civil War. In fact, the Spanish State is always a potential buyer of nonagricultural land. There has even been special legislation passed to enable the State to intervene in any private land transaction, and purchase the land itself, on the same terms as had been agreed to by the prospective buyer.

The work on municipally owned land is executed by the Forest Administration, but the costs are met on a basis of long-term reimbursement. These lands constitute, of course, the largest proportion of those afforested up to date. No exact figures are available, but it is fair to suppose that they amount to about 80 percent of the total afforested area.

The figures for work carried out by private enterprise are far behind the above. A total of only about 50,000 hectares seems to be its contribution to the afforested area in the country.

The afforestation of 1 million hectares has made it necessary to intensify seed production and to establish a substantial network of nurseries. Likewise, a wide network of forest roads and paths has had to be built to make possible the execution of the work; some 10,000 kilometers of forest roads and paths have been built in the period 1940-56. In addition, 269 lodgings for rangers and 569 miscellaneous buildings have been constructed.

The main species employed in the program are: indigenous pines (*pinea*, *halepensis*, *laricia*, *silvestris*, *uncinata* and *canariensis*), *Pinus radiata* and *Eucalyptus*. A variety of non-coniferous trees are also used — particularly poplars — although on a much smaller scale, since they require much more favorable environments. There are no precise figures showing the areas where each species has been planted, but it seems that up to date not more than 22 percent of the total area has been planted with the most fast-growing species — pinaster pine (ecotype from Galicia), *Pinus radiata* and *Eucalyptus*. The latter genus, which has been planted on about 170,000 hectares, merits particular comment.

Spain is, in fact, one of the pioneer countries in the region as regards eucalyptus plantings; more than half the area of eucalyptus plantations existing in the Mediterranean region are to be found in this country. From the outset of afforestation work in Spain, eucalyptus has been very frequently utilized. Unfortunately, precise figures showing the progressive expansion in the use of eucalyptus are not available at the moment, but it is fairly certain that these would show the increase to have been steady. (It is worthwhile mentioning this fact, because of the controversy that so frequently accompanies the introduction of eucalyptus) [4]. This trend leads one to surmise that the proportion of fastgrowing species utilized will increase in the coming years, thus enlarging the present rather low proportion.

[3] Today, 20,500,000 hectares, about 40 percent of total area of the country.

[4] Most useful experience on the utilization of eucalyptus for afforestation on clay soils is being gained in Spain.

Expenditure

Table 2 shows the total amounts devoted to the afforestation program and various works and installations essential to it, and the portion represented by United States aid. The investment has never exceeded 1.7 percent of the national income.

TABLE 2. – INVESTMENTS IN AFFORESTATION

Year	Funds from National Budget and officially guaranteed loans and bonds	U.S. aid
	..... *in million pesetas*	
1940	5.5	—
1941	14.6	—
1942	26.6	—
1943	38.1	—
1944	47.9	—
1945	66.5	—
1946	75.8	—
1947	85.4	—
1948	93.7	—
1949	131.1	—
1950	143.3	—
1951	178.4	—
1952	265.9	—
1953	365.7	—
1954	428.4	—
1955	467.2	48.4
1956	471.8	176.6

This gives an average cost per hectare afforested of 3,250 pesetas, complementary works (housing, roads, etc.) included.

Table 3 shows the costs of afforestation with and without mechanization, including the cost of the necessary nurseries for the planted areas, during the present and recent years.

If we bear in mind the fact that roughly one third of the afforested area is very intensively worked with mechanized means, and two thirds without mechanization, and that the beating-up covers about 40 percent of the afforested area, the total cost per hectare in the last few years and in the current year is as follows:

Year	*Cost, per hectare, in pesetas*
1955	3,240
1956	3,589
1957	3,840

During the last few years costs have been substantially increasing; the reason for the increase, however, is not connected with forestry, and not due to any modification of planting techniques or methods.

The value of United States' aid for the program amounted to 9.4 percent of total investment in 1955 and 27.2 percent in 1956. This means that some 12,000 hectares were afforested in 1955 with U.S. aid, and some 35,700 hectares in 1956, that is to say, that the funds allocated have been of substantial help in maintaining the pace of afforestation in Spain.

TABLE 3. – BREAKDOWN OF EXPENDITURE PER HECTARE

Type of expenditure	1955	1956	1957
	..... *in pesetas*		
Nonmechanical afforestation:			
Wages	2 116.20	2 116.20	2 249.00
Material and transport	104.99	104.99	167.12
Social insurance	95.65	95.65	112.89
Supervisory expenses	119.04	119.04	138.72
TOTAL	2 435.88	2 435.88	2 667.73
Mechanized afforestation:			
Wages	675.67	532.24	710.60
Material and transport	956.40	1 217.50	1 067.00
Social insurance	31.19	35.30	34.57
Supervisory expenses	93.85	101.03	103.27
TOTAL	1 757.11	1 886.07	1 915.44
Nurseries:			
Wages	279.05	400.23	357.53
Material and transport	91.05	76.19	118.39
Social insurance	13.68	18.41	19.34
Supervisory expenses	19.89	27.63	22.81
TOTAL	404.28	522.46	518.07
Beating-up [1]*:*			
Wages	1 002.73	1 318.64	1 507.00
Material and transport	57.50	57.09	69.85
Social insurance	45.32	59.60	75.65
Supervisory expenses	55.57	77.51	92.03
TOTAL	1 161.12	1 512.84	1 744.53

[1] Beating-up means to restock failed and blank areas with fresh sowings or plantings.

The figures quoted show that the most striking feature of the Spanish afforestation program is that *the costs are surprisingly low.* They are about one quarter of those in Italy and Algeria, and about one third of those in France, Turkey, Morocco or Greece. Bearing in mind that most of the work is carried out without mechanization, and that more than 80 percent of costs are wages, one is led to suppose that the main reasons lie either in extremely cheap manpower or in much simpler techniques.

It is clear, however, by the success of the Spanish program on extremely arid lands, that the techniques are sound. The conclusion is inescapable, therefore, that low costs must be attributed to cheap manpower. The daily wage of Spanish unskilled forestry workers varies between U. S. $0.80 and $1.00 and is, in fact, lower than in many countries of the region.

Employment of labor

It has been frequently stated by the Spanish Administration that although the primary objectives of its policy are to increase forest production and protect reservoirs and cultivated lands, a third fundamental aim is to give employment to labor in certain zones where there is marked unemployment.

It is this concern with creating employment which, from the outset of the program, has led the Forest Administration to begin its afforestation program with the very degraded zones in the Central or Levantine regions. This view has always been advanced by the Forestry Administration to meet criticism of its action in giving priority to very dry zones when more favorable lands still remained unafforested. Fortunately, the progressive adoption of better techniques and the vast experience gained has made possible results which are far more encouraging than those initially expected and this has contributed in no small measure to encouraging the Administration to carry on with this policy.

Moreover, the concern for high levels of employment in forestry work has, to a certain extent, helped the adoption of more intensive silvicultural techniques, which, in their turn, have proved very remunerative. For instance, the need to provide employment led to the plowing of many eucalyptus plantations in southern Spain, and the consequent yields were more than doubled. Another beneficial result of this policy has been that it enables advantage to be taken of the concentration of workers to give them some training and cultural education. On the large afforestation sites, the construction of schools for workers figures as another necessary infrastructure work in the relative budgets, and schoolmasters are on the same technical staff payroll as foresters; thus, new drivers, mechanics, smiths, etc., needed in the works are progressively selected from the ranks of previously untrained workers.[5] This is perhaps one of the most interesting aspects of the Spanish afforestation program.

Table 4. – Relative Cost of Labor

Year	Wages	Material and transport	Social insurance	Supervision	Total
		Nonmechanized projects			
1955	84.34	6.91	3.86	4.89	100
1956	85.07	6.13	3.85	4.95	100
1957	81.81	8.97	4.15	5.07	100
		Mechanized projects			
1955	44.20	48.46	2.08	5.26	100
1956	38.72	53.71	2.23	5.34	100
1957	43.89	48.71	2.22	5.18	100
		Beating-up			
1955	81.89	9.50	3.78	4.83	100
1956	84.45	6.55	3.83	5.17	100
1957	82.40	8.32	4.20	5.08	100

It was not until 1950 that mechanization was increased, and even now, only one third of the present volume of work is carried out by mechanical means. The restoration of Spain's external trade has enabled the greater use of machinery. The difference in the use of labor according to changes in technology is illustrated in Table 4, where it is seen that, even in mechanized projects, labor costs account for more than half the total costs.

The concern of the Spanish Administration with maintaining a high rate of employment in afforestation works is illustrated in Table 5.

Table 5. – Total Employment Afforded Exclusively by Afforestation Work in 1956

Period	Man/days,
First trimester	
January	1 620 000
February	1 040 000
March	1 740 000
Total	4 400 000
Second trimester	
April	1 024 390
May	888 604
June	887 006
Total	2 800 000
Third trimester	
July	630 000
August	562 500
September	607 500
Total	1 800 000
Fourth trimester	
October	1 400 000
November	1 250 000
December	1 350 000
Total	4 000 000

Future Production from Afforested Areas

The Spanish Forestry Administration estimates that the output of timber from the afforestation projects already carried out could reach about 2 million cubic meters per year, after 10 to 15 years.

The figure is based on very detailed and conservative estimates. It can therefore be assumed that the afforestation program already carried out is almost sufficient to cover the Spanish deficit in timber. The present average requirements for roundwood are estimated in Table 6 by the *Dirección General de Montes* in its *Memoria de actividades realizadas en 1955.*

This is equivalent to about 4.5 million cubic meters of standing timber. The actual forest production in Spain in recent years has been about 3.2 million cubic meters annually,[6] which means that a substantial deficit of about 1.3 million cubic meters has still to be met, a deficit which is, however, far below the figure of expected production from the newly planted areas.

[5] In the province of Huelva alone, the Forest Service has constructed 12 new schools (1954) and one hospital for forest workers.

[6] Data from: *Producción y comercio forestal*, of the Ministry of Agriculture, Madrid, 1957.

Table 6. – Average Roundwood Requirements

Source of demand	Cubic meters
Cellulose industry	200 000
Packing	900 000
Pit-props	980 000
Poles	40 000
Sawlogs	1 250 000
Sleepers	300 000
Total	3 670 000

It is quite certain, however, that by the time the new areas begin to yield, timber requirements in Spain will be much greater than now.

The present consumption of timber per head in Spain is about 0.12 cubic meter, far below the average in Europe (0.45 cubic meter). Assuming an increase in population of 7 per 1,000 annually, and a consumption of timber per head equivalent to the present Italian one, it might be expected that within 35 years the Spanish consumption of timber will be about 7.4 million cubic meters. To meet this requirement, another 1 million hectares should already have been afforested on the same ecological pattern.

In fact, it is improbable that the figure of 3.2 million cubic meters as the average production from existing forests can be much increased. It is estimated by the Forestry Administration that in the course of the last 15 years a sawmilling volume of more than 12 million cubic meters in excess of normal growth has been extracted. Thanks to this extra cutting, the difficult situation during the 'forties was overcome and the more urgent demands for sleepers, pit-props, etc., were met. Obviously, however, compensation will have to be made for this overcutting.

Results of the Afforestation Program

A much more detailed analysis is required to give an insight into the full impact of the afforestation program on the Spanish economy as a whole. It is only since 1952 that the rhythm of work has been steadily increasing, and figures of over 100,000 hectares per year were not reached until 1953. But the case of the province of Huelva may be singled out to show some particular effects of the program.

In this province, the State Administration purchased or acquired by contract a total of about 84,000 hectares between 1942 and 1956. At the time of the transaction, all the land was covered mostly with undergrowth and scrub. The entire area was virtually uninhabited, except for the temporary presence of shepherds and a few farmers practising shifting cultivation, moving to new tracts every 12 or 14 years. The only livestock was a few herds of goats, of very low yield. It could be said that the whole area was unproductive and uninhabited. Both the climate (not more than 400 millimeters irregularly distributed) and the soil (the most alluvial, podsolized sands) were extremely adverse.

The area afforested during the last few years is some 60,000 hectares, one half of which was planted with fast-growing species, mostly eucalyptus, acacia, black poplar, and the rest with slower-growing species, mainly pines.

As a result of this work, 21 new communities, with schools, recreation centers, etc., have been established, housing more than 10 thousand new settlers, 260 kilometers of new roads have been constructed, and a plant for cellulose pulp has been erected. This has completely changed the environment, transforming an almost desert region into one which is modern and highly productive. In effect, a transformation has been wrought in the very geography of the region.

A sum of slightly over 280 million pesetas has been invested in this projects, and this figure includes the purchase of the land. Approximately 10 thousand hectares of eucalyptus have already become productive, yielding annually more than 50,000 cubic meters of wood, at a value of 25 million pesetas, and it is estimated that the value of the reclaimed land now amounts to some 3,000 million pesetas.

Pasture improvement

The need to compensate as far as possible for the dwindling of the pasture areas due to the increasing forested area, has led the Forestry Administration to set up a plan for the improvement of pastures, within the framework of the afforestation program. This was considered indispensable if afforestation work was to proceed. The extent of grazing on forest or potential forest land in Spain is shown by the fact that the income from grazing on these lands is more than 50 percent of the income obtained from timber production on the same lands. In other words, more than 17 million hectares of such lands, i.e., 70 percent of the non-agricultural area, is utilized annually for grazing.[7]

The plan is intended to work in two different ways: establishment of a new grass cover by sowing exotic or selected indigenous species; and improvement of existing grazing lands by rotation, eradication of brush plants, construction of watering places and animal shelters, etc. In this connection, a great many experimental plots have been set up — no less than 600 in the Province of Aragon alone. These plots are managed in conformity with directives and norms dictated by FAO — the so-called Uniform Mediterranean Nurseries. The experience already gained has led to the setting up of 20 nurseries for the production of "pratensis" species, covering an area of about 4,000 hectares. Over 30 exotic species have proved to be particularly well-adapted to the dry conditions in Spain. Among these it is worth mentioning particularly various ecotypes of fescues, bromo grass, oats, cynosurus, agropyron, lotus, poa grass, alfalfa, medysarum and clover. But, however

[7] M. Navarro Garnica, *Pastizales españoles*, of the Ministry of Agriculture, Madrid, 1955.

valuable the introduction of exotic grass may prove to be, domestic species have not been dispensed with in the experimental work, and a seed collection campaign has been organized in order to meet the demands for an adequate supply of seeds. The following indigenous species seem to be the ones most worth propagating: *Agropyron cristatum*, *Agrostis* sp., *Dactylis glomerata*, *Festuca rubra*, *Hedysarum humile*, *Lolium rigidum*, *Medicago lupulina*, *Medicago sativa*, *Poa pratensis*, *Sanguisorba minor*, *Stipa lagascae*, *Trifolium pratense*.

The plan for pasture improvement is at present only in the experimental stage. In 1956, restoration was carried out by means of experimental seeding over considerable areas of pasture land in certain provinces; in this respect, it is worth mentioning the work being carried out in Lugo for an over-all development of pasture land in the zones which have been marked out for reforestation. In this way the Administration expects to extend afforestation without encroaching on livestock interests. It has been pointed out elsewhere in this paper that the Spanish Administration anticipates that the improvement of one third of the grazing land will permit the same livestock production as is obtained at present from the whole area. Although exact figures to prove this assumption are lacking, some indications have guided the Spanish Administration in adopting this view. It has had in mind the conclusions reached by Long and by Kellog. Long[8] has pointed out that in certain arid areas of the Middle East with a precipitation of 250-400 millimeters, pasture lands so degraded that one sheep per 10 hectares must be considered as too great a charge, could, with minimum improvement practices, provide excellent sheep ranges producing an annual income of about 1 sheep per hectare. That is to say, he anticipates a tenfold increase; the Spanish Administration, working under far more favorable ecological conditions than those described by Long, can therefore surely be justified in anticipating a threefold increase.

Similarly, Kellog has pointed out[9] that the productivity of more favored arid range lands could amount to something like 45 kilograms of sheep per hectare. Since a charge of 20 kilograms of sheep per hectare may be surmised, at least in certain zones of Spain,[10] to reach the production quoted by Kellog would imply an increase of 230 percent, which is not far removed from the figure already accepted in Spain.

When the pasture improvement plan reaches its full development, it is expected that valuable information will be available on this question of great importance in all the Mediterranean mountain region, particularly as to the species to be employed, techniques, machines — whose utilization seems to be indispensable for such types of work — costs and livestock weight fed by units.

Considered in itself, the Spanish afforestation program as a whole provides a valuable example of dynamic forestry action in the Mediterranean Basin. Its most important feature is, without doubt, its size and the effect it has had on employment. The country has become aware of its forestry problems and a basis has been established for the improvement of the Spanish forest economy. At the same time as restoration of the forest cover on 1 million hectares of land has been effected, a substantial part of the labor force of the country has been receiving a regular salary, and has found in the program a source of income and a means of obtaining training.

What is the future of the present afforestation program? The answer would depend on the findings of a more general study of the Spanish economy. From a technical point of view, the target set could be easily obtained, and even 200,000 hectares could be afforested yearly, but the extent to which this could be achieved would depend on the more general problems of allocation of investment resources (including foreign aid), and also on a solution of the specific problems of Spanish agriculture.

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[8] G. A. Long, " Main Aspects of the Grazing Problem in this Area (Jordan) ", mimeo, FAO/55/3/1890, Rome, March 1955.

[9] Ch. E. Kellog, " The Role of Science in Man's Struggle on Arid Lands ", in *The Future of Arid Lands*, Am. Assoc. for Adv. of Science, Washington, 1956.

[10] Unfortunately, there are no precise data on the permanent charge of livestock per hectare in Spain, but the figure quoted has been deduced from *Contribución al Estudio Pastoral del Levante español*, by J. Prais Llaurado, Ministry of Agriculture, Madrid, 1956.

Utilization of Structural Wood in Housing

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This article is Chapter 4 of a study entitled Trends in Utilization of Wood and its Products in Housing *undertaken by the joint secretariat of FAO and the Economic Commission for Europe (ECE). The study has a limited aim and has been undertaken at the request of the ECE Timber Committee, in the hope that a review of this kind might throw light on future trends in sawnwood consumption in Europe. Since it deals with only one sector, new housing, which accounts for only one fourth of all sawnwood consumed in Europe, it can afford only certain indications of that trend. A comprehensive assessment of prospects for sawnwood would require the preparation of similar studies covering the other principal sectors of consumption. It is intended to prepare parallel studies of this kind, starting with packaging, as and when resources permit.*

The wooden house or wood-walled house is not characteristic of European housing. It is highly localized, and accounts for but a small fraction of the European housing stock and for an even smaller fraction of the annual additions to that stock. The overwhelming proportion of sawnwood consumed in European housing enters into one- and two-family houses and in apartment blocks built of bricks, stone or concrete; it is consumed either in the house itself — as a building element (in the roof structure, joists and beams covering the basement and supporting the floors and ceiling, and various framework) or in joinery (flooring, doors, windows, stairs, cupboards, etc.) — or as part of the equipment used in the erection of the house (scaffolding, and molds for concrete constructions). Of the wood that becomes a permanent part of the house, that used for the building elements is required, generally speaking, in larger dimensions and with higher strength qualities than that used for joinery.

Reports from a number of countries point to the fact that it is as a structural element that the use of wood has declined most, and that this decline is closely bound up with changed methods of construction. On this point some informative figures are available for various regions of Austria (Table 1).

These figures show that, in Austria, wood consumed in joinery work per dwelling unit has fallen, as compared with before the war, by 10 percent to 15 percent whereas that used for the building elements has in general declined by 30 percent to 45 percent. The fall in the use of wood for building elements has been more marked in blocks of apartment houses than in one- and two-family houses (which in any case use, on the whole, more structural timber) and it has accelerated since the war.

Thus the impact on total structural wood consumption for housing in Austria (and elsewhere) has been greater than is suggested by the figures just quoted, since, from 1949 onwards, a greater proportion of the dwelling units provided have been in the form of blocks of apartments.

Trends similar to those recorded in Table 1 have also been noted for Greece. In Sweden, while structural wood has shown a marked decline, the amount consumed per dwelling unit in joinery work has actually increased, the rise being associated with an increase in the size of the average dwelling unit.

Piecing together the scattered indications available, we may hazard the guess[1] that building elements today

Table 1. – Austria: Consumption of Sawnwood per Dwelling Unit, 1936-1937 to 1950-1954

		1936-1937	1946-1949	1950-1954	Percentage fall from 1936-1937 to 1950-1954
Blocks of apartment houses		*... in cubic meters .....*			
Kärnten	A	6.7	6.4	3.6	46
	B	3.6	3.3	3.1	14
Steiermark	A	10.5	9.5	6.1	42
	B	3.6	3.3	3.2	11
Vorarlberg	A	6.9	6.3	4.2	39
	B	2.1	1.9	1.8	14
Tyrol	A	9.24	0.80	0.80	92
	B	2.55	2.55	2.55	—
Oberösterreich	A	5.10	3.95	2.66	48
	B	2.50	2.20	1.50	40
Suburban one- and two-family houses					
Kärnten	A	9.5	8.5	6.8	28
	B	3.6	3.4	3.2	11
Steiermark	A	10.5	9.5	7.3	30
	B	3.6	3.3	3.2	11
Vorarlberg	A	7.0	6.2	4.8	31
	B	2.2	2.0	1.9	14

A: for building elements
B: for joinery work

[1] This estimate is based on reports of the trends in various components in different countries, as well as on the data already cited. The following additional figures for Austria (relating this time to the whole country) may be of interest:

Proportion of Wood Consumed for Building Elements

	1937	1950	1954
	.....	*percent*	.....
Blocks of apartment houses	60	50	52
Suburban one- and two-family houses	65	59	52
Rural houses	74	71	68

account for 50 percent of all the sawnwood used in new residential construction in Europe, as against perhaps 60 percent before the war. If this guess is near the mark, it would mean that about 8½ million cubic meters of Europe's current sawnwood consumption are used structurally in new housing.

The roof

Much of the structural wood goes into the framework of the roof, and it is here that important reductions in per-unit use have occurred. Yet reports suggest that the direct substitution for timber of other materials has been a relatively minor factor; where this has occurred it has been associated with changed housing patterns and changed methods of construction.

The lower consumption of roofing timber per dwelling unit may be ascribed to a number of factors:

(*a*) the increasing proportion of multi-family constructions, which automatically reduces the roofing per dwelling unit;

(*b*) the increased proportion of flat, as distinct from triangular roofs, and the adoption of lower-pitched roofs;

(*c*) the trend towards lighter roof structures; making use of smaller dimensions;

(*d*) the replacement of timber by other materials, notably reinforced and more latterly, prestressed concrete.

The first of these is discussed elsewhere in the study. The trend there noted seems certain to continue, and it will lead to a further reduction of the timber required on average per dwelling unit. Normally, multi-family construction is flat-roofed, though not invariably so. Some countries (e.g., France) report a reaction against flat concrete roofs in multi-family construction as defects appear in blocks built 10 to 20 years ago. However, the reaction is slight, and certainly only temporary, since concrete building methods have made great advances in the last two decades. In one- and two-family houses, flat roofs do not appear to be gaining ground in western and northern Europe. Indeed, they may be less common, among recent constructions, than in the immediate postwar years, when timber shortages in a number of countries prompted exceptional measures to reduce timber consumption. Of new residential constructions authorized in Belgium over a recent period, only 19 percent provided for flat roofs. In many countries the pitched roof is still preferred, both on aesthetic grounds and because of the additional space afforded, and on the whole there seems to have been a reversion to this traditional pattern for the one- and two-family house in countries where controls established in the early postwar years have been relaxed. The shift towards lower-pitched roofs, however, although in the first instance deliberately undertaken by architects to meet specific quantitative restrictions on the use of timber, seems to be permanent.

The utilization of smaller dimensions has undoubtedly been a factor of great significance; it reflects the application of engineering principles to the rational use of wood which started before the war and was given a great impetus in the postwar years both by specific timber shortages and by the rise in the price of wood in relation to those of other materials. This feature of postwar development which is not, of course, confined to the use of wood in housing, is discussed elsewhere in this report. Here we may content ourselves with noting that by assessing carefully the strength properties which will be required of each wood element, it has been possible to have recourse to shorter lengths, smaller — often different — cross-sections and wider spacing, while yet preserving adequate safety margins. Further progress certainly will be made in this direction, though the difficulties in applying engineering principles to wood — which is a natural product and therefore subject to considerable variations — are many. So far as roof structures are concerned, the technician's task has been facilitated by the adoption of new and lighter insulation materials. Significant wood savings, as well as labor savings, have also been realized by the adoption of nailed roof trusses, nailing replacing the carpenter's joint.

This trend towards lighter framing may be expected to continue. In many western European countries, the typical one- or two-family house of brick or artificial stone still retains its double-pitched, timber-framed roof. Undoubtedly, the failure of steel and prestressed concrete to make considerable inroads in smaller houses has been due to the fact that architects and builders have found the way to considerable wood economies. The emphasis on lighter framing in the Scandinavian countries has already been mentioned. In the United Kingdom, roof trusses developed by the Timber Development Association are reported to have won some acceptance. In Belgium, it is reported that a new design developed by the study and research service of the *Société nationale des habitations et logements à bon marché* requires only 2 cubic meters, as against 4 cubic meters before the war and less than 3 cubic meters in 1954.[2] It is estimated that in France the amount of roofing timber required per square meter of area covered fell from 0.10 cubic meter in 1935 to 0.05 cubic meter in 1950 and 0.03 cubic meter in 1955; a further decline to 0.025 cubic meter by 1960 is envisaged. In Greece, it is estimated that the per-dwelling consumption of wood in roofs declined from 3.6 cubic meters in 1938 to 1.6 cubic meters in 1955, a reduction of 2.0 cubic meters, or 56 percent. Lighter wood structures not only reduce cost, but emphasize one of the special advantages of timber in relation to its competitors. Steel is heavier, and in addition requires more maintenance. Prestressed concrete is much heavier, requiring stronger walls and thus adding to total costs.

[2] Thus roof timber accounted for an important part of the total decline in unit consumption in Belgium, from 9.5 cubic meters in 1938 to 6 cubic meters in 1954.

Thus, in the traditional one- and two-family house in western Europe, timber's place in the framework seems assured. Consumption per dwelling unit in several countries has probably reached its minimum, at somewhere between 2 and 3 cubic meters, since there is no indication that lighter roof-covering materials will displace the traditional clay tile. Certain countries, however, still consume more than this minimum; a German report, for example, sets the roofing timber required per unit at from 2.3 to 4.8 cubic meters, according to the design of the framework and the roof covering. This suggests that there is still scope for a reduction in timber consumption. In northern Europe, wood is still used more lavishly, in both framework and roof covering, but a steady shift towards timber-saving designs will undoubtedly bring about further reductions in wood use. Information available for Sweden indicates a per-dwelling reduction in roof and attic joists from 6.6 cubic meters in 1938 to 3.2 cubic meters in 1955, or a decline of 52 percent. During 1955 it is estimated that a small Swedish wood or brick or stone house required 8.4 cubic meters and 9.0 cubic meters of wood respectively for roof and attic joists, while similar apartment dwellings utilized 3.8 cubic meters and 1.1 cubic meters. In Sweden, a small brick or stone house has on the average used more wood for roof elements than a wooden house.

But while timber maintains, and is likely to continue to maintain its position as roof structural material in the traditional one- or two-family house in western Europe, thanks largely to wood savings which have been effected, in southern and eastern Europe, the typical small urban house is already built in artificial stone and is usually flat-roofed. In Poland, for example, the roofs are generally prefabricated in concrete. Moreover, in these areas one- and two-family houses represent an ever-diminishing proportion of urban residential buildings. In multi-family blocks, throughout Europe, the quantity of timber used for roofing is very small.

Finally, if we look at the situation for Europe as a whole, we note a tendency for housing programs in western Europe to stabilize, while those in eastern Europe, where housing activity has admittedly lagged during the last decade, are expanding. This development, in association with the trends which have previously been mentioned, will tend progressively to reduce European consumption of roofing timber per dwelling.

How much timber is currently consumed in roofs for new residential construction in Europe? The total volume may be regarded as a function of the total housing program, the proportion provided in multi-family blocks, and the unit timber consumption per roof. In round figures, we may regard the European housing program as consisting of, say, 1.1 million one-family houses and 1.1 million in multi-family blocks, the latter corresponding (assuming an average of 4 stories) to 0.3 million roof structures. As to the proportion of each timber-roofed, some French estimates are available which afford a partial clue. According to these estimates, the percentage timber-roofed is said to have developed as follows in Table 2.

These figures reflect timber's relatively firm hold in one-family dwellings and the renewed progress which concrete is expected to make, following earlier setbacks, in multi-family construction. Reports suggest, however, that for multi-family construction in Europe as a whole the proportion is nearer one half. As for one-family

Table 2. – France: Estimated Percentage of Timber-Roofed Houses, 1920-1960

Year	Multi-family	One-family
	percent	
1920	95	98
1935	50	80
1950	70	85
1955	75	85
1960 (expected)	60	80

building, the proportion is undoubtedly as high or higher in other western European countries and in Scandinavia, but lower in southern and eastern Europe. Having regard to the size of the individual housing programs, 85 percent may not be far off the mark. This suggests that fractionally over 1 million out of the 1.4 million roof structures in Europe today are of timber. Unit timber consumption, as we have seen, varies enormously: about 2 cubic meters in the United Kingdom; rather less in Greece; slightly more in France; 3 cubic meters in Belgium; 2.5 to 4.5 cubic meters in Germany; rather more in Scandinavia.

These (except for Germany) are averages for all dwelling units, including nontimber as well as timber. They suggest that it may be reasonable to assume a European average (all dwellings) of about 2.5 cubic meters, corresponding to average consumption in timber roofs only of 3.25 cubic meters. This leads to the conclusion that roughly 3.5 million cubic meters of timber are being consumed annually in the roofs of new dwellings in Europe — i.e., about 40 percent of all timber used structurally in new residential construction goes into roofs.

The interstory structure, ceilings and floors

The building element which supports the floor may be of wood and the actual floor surface of some other material, and vice versa. This suggests the advisability of separating a discussion of structural timber in floors from that of the flooring surface. The following paragraphs are primarily concerned with the building elements, but it will be necessary to make some reference to the flooring because, in some of the data available, a rigid distinction cannot be drawn.

The function of the interstory element is to provide a support for the floor above and the ceiling below, and to give rigidity to the whole structure. It is, therefore,

necessary to distinguish between ground floors and first floors in two-story structures, and between two-story and multi-story constructions. While the fate of wood in each has differed somewhat from country to country, broadly speaking it can be said that, for Europe as a whole, wood has been routed in the interstory elements of multi-story constructions, has lost considerable ground in ground floors and is meeting with varying success in resisting the encroachments of other materials in first floors.

As a ground-floor support, concrete has met with much more success in displacing wood than in roof structures. Indeed, in the days of intense wood shortages immediately after the war, there was active discouragement, and in some cases total prohibition, of wooden ground floors. For suspended floors, there was a switch to prefabricated concrete joists of various types, sometimes to composite steel and timber joists. But frequently the suspended floor gave way either to solid concrete floors cast on the site, or to prefabricated concrete floors. In the United Kingdom, for example, where controls for many years ruled out wood floors, the return to wood floors since the ending of building controls and the delicensing of softwood has not been particularly marked. Where the market has been recaptured by wood, it has been either because site conditions enhanced the cost of concreting, rendering wood more economical, or, more usually, because the consumer preferred the wood floor for reasons of taste even though it might be more costly. One reason why concrete floors have proved more economical is that they eliminate the brick sleeper walls which formerly carried the plates and joists.

Elsewhere in the study it is noted that there were very great differences in timber consumption per dwelling unit among the various European countries, and that these differences by no means corresponded exactly with the availability of domestic timber supplies. Traditional usage is a powerful factor, and that may stem from accessible indigenous materials; but also it may relate to a period when imported supplies were plentiful and cheap. Thus while it is clear that the prevalence of all-wood houses is closely connected with local timber availabilities — such constructions remaining typical of rural areas in wood-surplus countries and surviving almost as curiosities in many wood-deficit countries — the fate of the wood floor in nonwooden one- and two-family houses in the various European countries on the whole reflects the general timber supply situation, modified in certain instances by the weight of tradition. In Italy, wood floors were supplanted many decades ago; in Scandinavia, the decline is relatively recent. In the United Kingdom, but for war and postwar shortages, the wooden ground floor might have survived, in spite of its falling competitive power. In fact, it was driven out under controls, and its limited comeback after decontrol has largely been due to traditional factors.

Thus, whereas timber ground floors were undoubtedly the most important in Europe for one- and two-family houses 20 years ago, today they have been largely replaced by solid concrete floors. This trend has proceeded at different rates from country to country, but there is little likelihood that it will be permanently reversed anywhere. Unfortunately, representative statistics on ground-floor constructions are totally lacking, [3] and it is difficult to sum up the situation from the descriptive accounts which are available. However, if we assume that the dwelling units annually provided today in Europe represent 1.4 million ground-floor constructions, the probability is that no more than half a million, and perhaps as few as a quarter of a million, involve structural wood.

As the interstory element in two-story, one-family houses, timber has resisted the challenge of concrete (reinforced to a greater or lesser extent, often combined with ceramic elements) much more successfully. The United Kingdom, for example, reports no evidence of any general substitution for timber in this end-use. The situation seems to be similar in Germany. In Belgium and in Sweden [4] the competition of concrete is making itself felt, while in France timber has lost ground rapidly in the last two decades, accounting today for only 30 percent of the ground-floor and interstory building elements in one-family houses: [5]

Table 3. – France: Diminishing Use of Timber in Housing, 1920-1955

Year	Percentage in wood	
	Multi-family constructions	One-family houses
1920	15	95
1935	2	85
1950	6	40
1955	8	30

Lower cost, better insulation and greater structural rigidity are the advantages claimed for various forms of concrete construction. Yet it may be doubted whether these provide the whole answer; certainly they do not explain the disparity in the trends in different countries just noted. Indeed, it is by no means certain that, on cost alone, the advantage lies with concrete.

In 1953, M. A. Martinoff carried out a study on the cost per square meter of realizing the interstory construction in various ways — e.g., the bearing element

[3] Though it is reported that, for one- and two-family houses in Sweden, 60 percent of ground-floor joists were of wood in 1950; by 1955 the proportion had fallen to 32 percent.

[4] The percentage of wooden first-floor joists in one- and two-family houses in Sweden fell from 77 in 1950 to 60 in 1955.

[5] These figures relate to *solivages* i. e., joists and beams employed in both ground-floor and interstory structures. However low the survival of the wooden ground floor, the figures imply a major incursion of concrete in the first-floor elements.

in timber, concrete or hollow bricks, the ceiling in lath and plaster, plasterboard, fibreboard or chipboard, the flooring in softwood boards or concrete, and the final floor covering in balatum, tiles, linoleum, parquet, etc. (Table 4).

TABLE 4. – BELGIUM: PRICE PER SQUARE METER OF DIFFERENT TYPES OF INTERSTORY CONSTRUCTION

(in Belgian francs: estimates based on prices ruling in the first quarter of 1953)

Type	Ceiling	Bearing element	Floor surface	Floor covering	Total price
Joists in native pine 2 ½ × 7 in.		156			
Covered with plaster boards	65				
Flooring boards in 3/4 in. northern red pine			119		340
The same, but with balatum covering				48	388
The same, but with joists in. northern red pine	65	173	119	48	405
Concrete or hollow bricks faced with concrete	34	199			
Surfaced with lightweight concrete			62		
Covered with balatum				48	343
The same, but covered with:					
2-3 mm. vinyl	34	199	62	103	398
Linoleum on felt				188	485
Parquet				238	533
Concrete or hollow bricks faced with concrete	34	199			
With floor boards in 3/4" in. northern red pine			140		
with balatum				48	421
The same, but with:					
Cement squares	34	199	144		377
Granite squares			184		417
Ceramic squares			245		478

Thus, at the prices then ruling, the traditional interstory construction with wood flooring did not compare unfavorably, from the cost standpoint, with most of the alternatives. Nor had this competitive advantage disappeared in Belgium in 1955. Comparative costs per square meter adduced by an architect consulted at the end of 1955 were as follows in Table 5.

These figures suggest that the margin of cost advantage may have narrowed, but that it had not disappeared at the end of 1955.

In the United Kingdom, too, the traditional softwood structure remains competitive. An official publication, *Houses that Save Softwood* (H.M.S.O., 1953), gives some interesting data drawn from demonstration houses built on four sites to illustrate the effect of using materials other than softwood. The softwood savings and extra cost on a standard three-bedroomed house as compared with the traditional softwood joists and softwood flooring are shown in Table 6.

TABLE 5. – BELGIUM: COMPARATIVE COSTS

Material	Belgian francs per m²	
Wood		
Three 2 ½ in. × 7 in. joists	144	
3/4 in. floorboards	115	
Ceiling work on 15-mm. laths	70	329
Hollow clay blocks		
Reinforced hollow blocks	230	
Ceiling work	30	
Covering in 35-mm. cork	76	336
Reinforced concrete		
9-cm. concrete at B fr. 2,800 per cubic meter	252	
Plaster ceiling work	30	
Covering in 35-mm. cork	76	358

Here, too, it is unlikely that the cost advantage of the traditional softwood floor has seriously diminished since 1953. These figures make it easy to understand how timber has retained its place for the interstory element of traditional one-family house-building in the United Kingdom. One would expect the cost comparison to be about the same in wood-deficit western Europe, more advantageous in Scandinavia and less advantageous in the wood-deficit countries of southern and eastern Europe. In Italy, for example, timber floors and ceilings, like timber roofs, are virtually unknown in the southern half of the country, in the plains and in urban areas generally. Even in the mountainous and rural areas, where wood is the traditional material, cost is said to be the main factor bringing about a steady recourse to concrete.

TABLE 6. – UNITED KINGDOM: SOFTWOOD SAVINGS AND EXTRA COST INVOLVED

Type	Softwood saved		Extra cost £
	Standards	m²	
Prestressed concrete joists and particle-board flooring	0.394	1.84	34
Prestressed planks and hollow clay blocks with thermo-plastic tiles	0.443	2.08	39

Timber's greater success in retaining its place in first-floor construction than in ground floors does not rest on direct cost alone. Concrete constructions are very much heavier for a given load (Table 7).

Thus, a square meter of this construction weighs (taking the 4-meter length as an example), 175 kilograms. A timber construction giving the same useful load would require, per square meter, 3 meters of 2½ inches × 7 inches joists and 1 square meter of 4 feet 4 inches floor-

Table 7. – Belgium: Data for Reinforced Hollow Clay Block Constructions

Length of slab (m.)	Thickness (cm.)	Weight (kg./m²)
	Useful load of 150 kg. per m²	
2.63-3.12	7	90
3.13-3.50	9	145
3.51-3.87	9	145
3.88-4.37	9	145
4.38-4.75	11	175
	Useful load of 250-300 kg. per m²	
2.38-3.50	9	145
3.51-4.50	11	175
4.51-5.75	13	195

ing — a total of 0.061 cubic meter of softwood, weighing about 30 kilograms. The weight of a timber construction therefore works out at about one fifth of that of its concrete rival; hence the higher weight of concrete is a fact which has to be taken into account in planning the foundations.

In multi-story constructions (i.e., three or more stories) the interstory structure, like the ground floor, is today almost universally in some form of concrete. Steel — i.e., profile steel, as distinct from reinforcing steel — has never been very important save in one or two countries and in a few multi-story blocks. It had already lost much ground before the war and has continued to do so since. Wood is used on a very limited scale. Architects seem to agree generally that concrete elements give greater rigidity and stability to the whole structure. For this reason, and also because of fire risk, building regulations frequently preclude the use of wood structurally in multi-story buildings.

The current European housing program corresponds roughly to just under 2 million interstory structures (1.1 in one-family construction, 0.8 in multi-story blocks), of which perhaps half are realized in wood. Adding to these an estimate for timber ground floors, and reckoning 3 cubic meters on average for a ground floor or floor and ceiling unit, we can tentatively estimate European consumption in this end-use at 4 million cubic meters.

Roofs, floors and ceilings together account for the vast bulk of timber consumed structurally in housing; the other end-uses are diverse and difficult to classify. Moreover, the general considerations which apply to the use of timber in roofs, floors and ceilings equally govern other structural housing timber, so that separate treatment is scarcely necessary. However, before attempting to sum up the prospects for timber in the building elements in housing, it is necessary to offer one or two general observations on the technical merits and demerits of wood as a structural material, and on price trends.

Timber's limitations as a structural material

How far has the decline in the use of wood as a structural material in housing been the result of the manifest technical superiority of its rivals? This springs to mind as a central question in the present context, yet it may be doubted whether, even if a complete and satisfactory answer could be made, it provides the key to the developments which have so far taken place and which are continuing.

The technical merits and demerits of wood as a structural material in relation to its rivals have been well summed up by M. Campredon [6] in Table 8.

A variety of measures can be taken to eliminate or reduce the technical drawbacks of each of these three materials. Wood is a natural material, and the preservation of its form depends on its moisture content in relation to its surroundings. Complaints of contortion have been encountered with increasing frequency since the war, largely because circumstances have compelled the use of wood which had been inadequately or incorrectly seasoned. In recent years, these complaints have diminished, but the prejudice they aroused has survived in the minds of those called upon to make the choice of materials. One factor which has focused attention on the propensity of wood to shrink and swell has been the increasing proportion of houses and flats built since the war and equipped with central heating, involving marked seasonal changes in the humidity of the atmosphere. This is a disadvantage which can easily be countered by appropriate safeguards; in northern Europe, structural wood has been used in centrally heated dwellings for many decades without ill effects. Similarly, though various kinds of wood treatment can reduce proneness to attack by insects and fungi, in Europe, these measures are seldom necessary. Most architects agree that the exercise of care in construction and necessary maintenance can render this risk negligible.

Wood's inflammability is a more serious matter. It not only leads to enhanced insurance rates, but in a number of countries has brought about absolute prohibitions on the use of wood for certain purposes in constructing residential premises in congested areas.

The following premium figures, which apply to Norway, are believed to be representative:

	Mills per annum
Frame house	1.3
Brick house with timber joists	0.75
Fire-resistant buildings with fireproof floors	0.3

The fire risk can be considerably reduced by the prior application of fire retardants to the timber, and this does not raise the cost significantly. Unfortunately, few timber traders are equipped to provide the necessary service, and few consumers are aware of the possibility of reducing fire risk by appropriate treatment. Nor, in general, is any incentive provided by insurance companies in the shape of reduced premiums. In any case, it is not the builder, anxious to keep his costs as low as possible, who is primarily concerned with the degree of fire risk and the cost of carrying that risk.

[6] See, for example, his article "Le matériau bois" in the Nov.-Dec. 1954 issue of *Bois et forêts des tropiques*.

Table 8. – Comparative Technical Merits and Demerits of Wood as Structural Material

Wood	Steel	Concrete
Technical advantages		
Low density High resistance in relation to density, permitting, by new techniques, firm and decorative solutions Low maintenance costs Easy to repair, join and strengthen Easy to install, with cheap and simple tools Resists fumes and chemical agents	Low cross-sections, taking less space Light aspect Factory preparation Rapid installation	Permits strong and decorative solutions Long spans and heavy loads Modern architectural forms Prefabrication Prestressing
Disadvantages		
May distort Subject to insect and fungus attack Fire danger; higher insurance premiums Not acceptable for party walls Difficult to obtain in long lengths	Heavier pieces. Higher weight of finished construction Maintenance more difficult; mechanical means needed for moving and lifting Special tools required for installation Difficult to reconstruct after fires Subject to corrosion unless regularly painted	Much heavier, calling for strengthened foundations Setting time delays construction Useless after serious fire

As a natural material, wood not only has natural enemies: its suitability for structural purposes is subject to limitations by virtue of its heterogeneity and the lengths in which it is available. For centuries the craftsman has applied his arts to overcome these limitations, but only in recent decades — indeed only since the war in many European countries — has this problem been tackled in a scientific way and a determined effort made to place timber construction on a sound, up-to-date technological foundation. The timber engineer made his appearance in North America during the 'thirties. In Europe, although his advent is more recent, he has already many successes to his credit. One has already been mentioned — the reduction of cross-sections and the adoption of wider spacing. Of course wood has always been sorted and selected for particular uses in accordance with the strength properties required. But the selection has been on the basis of a superficial inspection, not always a sure guide to inherent strength properties, and the known variability of wood has made for tolerances many times those required for factory-made structural materials. Experiments carried out by Professor Siimes in Helsinki have shown that one deal or batten may be 12 times as strong as another of the same size and species. It is thus clear that very substantial wood savings could be made if it were possible to carry out strain tests generally, selecting for given use the pieces conforming to predetermined strength requirements, with an adequate safety margin. This solution, however, is not practicable. It is possible, however, to grade sawnwood before using it in accordance with its strength properties, and thus effect considerable savings. But stress grading raises a number of problems.

The first is that of grading with adequate precision on the basis of external characteristics. Studies carried out in Finland, Sweden, and the United States and elsewhere have shown that this problem is soluble, the quality grading being based on the following properties: knots, wane, slope of grain, density, rate of growth, shakes, bow, spring, compression wood, blue stain, rot, ingrown bark, worm holes, top defects, pitch pocket, cross grain, spiral grain, twist, concavity. Of these, density is the only property which cannot be readily determined on the basis of external signs. But even density can be measured with adequate precision by focusing attention on the spacing of the growth rings, though this is certainly the most difficult part of stress grading. Maximum limits for all these defects can be established for various strength classes. Stress grading, however, requires a more thorough training than current commercial, or appearance, grading.

Another problem arises from the fact that in many applications of sawnwood the external appearance is at least as important as, and sometimes more important than the inherent strength properties. Current commercial grading lays emphasis on appearance, with such indirect indication as appearance may give of strength properties. Already the sawnwood trade is complicated by the proliferation of grades and sizes, and the parallel existence of two separate grading systems would lead to further confusion. This problem would be soluble if there were a close correlation between quality and appearance grading, but researches to date suggest that, while a correlation undoubtedly exists, it is too loose to allow of a reconciliation of the two systems. Moreover, it has to be borne in mind that the use of wood structurally, where quality counts, has for some time been declining in relation to its consumption for purposes where appearance is the major consideration.

The need for stress grading, however, centers on a limited number of sizes used in building components. This simplifies its introduction in domestic markets.

In Finland, for example, it has been suggested that stress grading be introduced for use in seven size classes, mainly deals and battens, leaving appearance grading for timber used otherwise.

Its introduction in the export trade, however, is complicated by the fact that the standard structural sizes differ from country to country. It may be doubted whether, in the absence of a measure of international agreement on standards, stress grading can ever be practicable for internationally traded timber.

Finally, there is the problem of the attitude of producers, consumers and dealers towards stress grading, which are by no means in harmony. Consumers, in so far as they are aware of the possibilities afforded by stress grading, realize that it would effect wood savings and reduce costs. For both producers and dealers the adoption of stress grading could bring advantages in the long term, inasmuch as it would strengthen the competitive position of timber, though in the short run wood savings might mean lower sales. It would undoubtedly lead to greater price differentials between various qualities — a fact which militates against unanimity on the part of producers. Greatest resistance comes from the dealer, who is accustomed to buying appearance graded timber and effecting what is, in essence, a kind of stress grading in his own yard to meet the individual needs of his customers. Part of his profit stems from this service, and he is naturally loath to forgo it. This is why dealers have on many occasions, while paying tribute to the possibilities offered by stress grading, at the same time maintained that it should be carried out in the importing country. However, apart from the fact that this procedure would complicate the formation of international prices, it has to be borne in mind that the structure of the trade in most importing countries today, with a multiplicity of small firms, is such that the overwhelming majority of firms would be unable to find, train and utilize the necessary skills. There is no reason why the desired end, however, should not be reached through co-operative efforts on the part of smaller firms.

Finally, existing building codes have some bearing on this problem. Were these codes to be altered so as to presuppose stress grading, the adoption of stress grading would undoubtedly be accelerated.

Stress grading is the logical extension of the application of technological thinking to problems of wood construction. If it has made little progress to date, that is not to say that the ideas on which it is based have not been applied. Tolerances have been reduced, wood savings effected, and timber's competitive power strengthened — and this trend will undoubtedly continue however the debate on stress grading may ebb and flow.

But the technologist's contribution has not been limited to focusing attention on required strengths. In co-operation with the engineer, he has developed new, ways of using wood. New assemblies, often prefabricated, have been designed, giving greater rigidity for less weight. Clear roof spans of 8 to 10 meters are now practicable, and industrial trusses with spans of up to 30 meters have been realized. Research on timber connectors and nailed structures has yet to find its full application, while glued lamination offers infinite possibilities. It is true that many of the recent advances must be regarded as more relevant to other kinds of building than to residential construction. To realize their possibilities, and perhaps to find new applications in housing, it is necessary, first, that architects and consumers should be aware of the reduction in timber's limitations afforded by current research; secondly, that the architect should be able to enlist the professional advice of competent timber engineers in the same way as he can in solving problems of steel and concrete; and, finally, that timber used in novel forms should be competitive with its rivals — i.e., if it is more expenssive, the extra cost should not outweigh the compensating advantages.

Both steel and concrete have certain technical disadvantages, but in both these materials determined efforts are being made to remedy them. In steel, the trend is towards lighter sections, and various means have been found for checking corrosion. Concrete has increased its competitive position within the last decade through the development of prestressed concrete. Though demanding higher-quality cement and high-tensile steel wire, it provides considerable economies in both cement and steel. It is waterproof and does not crack to the same extent as ordinary reinforced concrete. The lower weight reduces transport costs and promotes prefabrication. Besides the advantage in many cases of lower initial costs, it carries important savings in maintenance. The use of prestressed concrete has steadily expanded since the war, but its full impact in most countries is yet to be felt.

It is not easy to draw firm conclusions from this short review of wood and its rivals as structural materials in housing. The trend against wood has clearly been due largely to the change in the type of dwelling unit built and to changes in methods of construction. This trend has frequently been accelerated by physical shortages of timber; at the same time it has been restrained by the application of new techniques which have permitted wood savings and by what may roughly be described as traditional factors. It would seem, therefore, that if wood is to retain its role as a structural material, emphasis should be laid on those particular advantages which wood possesses from the standpoint of the consumer, and on speedy application of the findings of the wood technologist and timber engineer, notably by taking advantage of any opportunities afforded by prefabrication techniques.

The significance of this last point is underlined if one reflects on the circumstances under which methods of construction underwent rapid changes in the years immediately following the war. At that time, most European countries turned to new ways of building houses under the pressure of shortages of various materials. But an equally important factor, which operated against wood even in countries with adequate domestic

resources, was the scarcity of skilled craftsmen and the need to keep labor costs down to the minimum. Hence methods of construction which permitted a higher degree of mechanization on the site, which permitted the transfer of labor costs from the site to the factory, through prefabrication, and which required either more readily available or more quickly acquired skills, were adopted, even where this meant an increase in crude material costs. Woodworking skills are not easily acquired, and over most of Europe the generation that should have been acquiring them was otherwise engaged for nearly a decade. The kind of constructions required during the war years called for different skills and different materials. This meant that in the post-war years, wood found itself under an additional disadvantage, which has survived to the present day. In western and northern Europe, the building industry is traditionally a small-firm industry, where the apprentice of yesterday is the skilled craftsman of today and the entrepreneur of tomorrow. Thus many of the builders in the postwar decade were men who had become accustomed to handling nontraditional materials in novel ways. The lost decade can never be recovered, but a wider understanding of wood's new possibilities might well check, though not reverse, the trend away from wood.

The influence of price

In the phases of residential construction discussed in the preceding pages, wherever timber has been displaced it has been replaced by concrete in one form or another, reinforced to a greater or lesser extent, frequently combined with ceramic elements such as hollow clay blocks. The competing materials are thus cement, reinforcing steel and clay ware; profile steel has nowhere been a serious rival.

The price of timber, in relation to these other materials, is very much higher than before the war, as shown by the examples in Table 9 for the United Kingdom.

Table 9. – United Kingdom: Building Materials Price Ratios (1938 = 1)

Year	Timber/cement	Timber/bricks	Timber/steel
1945	1.8	2.0	1.9
1946	1.8	1.7	1.8
1947	2.2	2.0	2.3
1948	2.3	2.2	2.1
1949	2.3	2.2	2.1
1950	2.2	2.0	2.0
1951	2.7	2.8	2.7
1952	2.8	2.8	2.4
1953	2.6	2.5	2.1
1954	2.6	2.4	2.1
1955	2.7	2.6	2.1
1956	2.6	2.6	2.0

Thus at the end of the war timber had doubled, or nearly doubled, in price as compared with alternative materials. In 1951, its competitive position suddenly worsened, and the improvement recorded since then, though marked in relation to steel, is negligible in relation to cement and clay components.

There is another aspect of price movements, besides the relative price trends, on which attention must be focused. If we examine the magnitude of year-to-year variations in the price of each material over the periods 1930-1938 and 1945-1955, we see that these fluctuations have been much more marked for timber than for other materials (Table 10).

Table 10. – United Kingdom: Year-to-year Percentage Changes in the Prices of Building Materials (1930-1938 and 1945-1956)

Changes, percent	Timber	Cement	Steel	Bricks (postwar only)
Unchanged	1	1	3	1
Not more than 5%	8	14	9	8
5 %, but not more than 10 %	3	5	7	3
10 %, but not more than 20 %	5	1	1	1
Over 20 %	2		1	

Thus a year-to-year change in price of over 10 percent occurred once only for cement, twice for steel, but no less than seven times for timber. In many respects, stability of price is no less important than the level of prices to those concerned with constructional work. Though timber prices in Europe have remained fairly steady since 1953, there is no doubt that recollections of the unhappy consequences of past violent fluctuations, and fears of future sharp changes, have created in the minds of those responsible for the choice of building material a prejudice which will be hard to dispel.

The price data cited in the foregoing Tables relate to the United Kingdom. Similar data could be quoted for nearly every European country. It is evident that the increase in timber's relative price has been responsible for some of the decline in timber consumption per dwelling unit, though it may be doubted whether this factor has been as potent as is commonly supposed. So far as the structural elements are concerned, the change in the size and type of dwelling unit provided would have brought about a considerable reduction in timber usage per unit independently of relative price considerations, though undoubtedly the higher price of timber, and specific timber shortages, have helped to hasten those changes. In particular end-uses, there are examples of timber being preferred in spite of higher cost; there are equally examples of shifts towards concrete even where the traditional structure appears to remain competitive.

The prospects for structural timber in housing

About 8.5 million cubic meters of sawnwood are being used annually as structural elements in new residential construction in Europe (excluding the U.S.S.R.). This is about half of all sawnwood used in housing, and represents a sharp fall from the estimated pre-war proportion of 60 percent. Of this 8.5 million cubic meters, about 4 million cubic meters go into floors, ceilings and interstory structures, slightly less into roofs, and the rest into a variety of miscellaneous uses. Thus it is in the building elements that the use of sawnwood has declined most.

The fall that has taken place in per unit use may be attributed to:

1. changes in the size and type of the average dwelling unit (including changed methods of construction and the shift towards multi-family blocks);
2. straightforward wood economies (smaller dimensions, improved design);
3. replacement of wood by other materials.

Though not statistically demonstrable, it is likely that the order in which these factors are cited reflects their relative importance. Price has, of course, entered into each, though to a varying extent.

Changes in the dwelling unit have come about partly as a result of social influences (demographic trends, urbanization, etc.) and partly as a result of changed methods of construction designed to economize in labor costs, to meet shortages of specific labor skills, or to make use of materials which were cheaper or more readily available than timber.

The effect of more rational use of wood, through better design and less extravagant tolerances, is most clearly seen in roofs, where timber retains a firm hold on the market in one-family houses in many countries, though its role in multi-construction has considerably diminished. It may be expected that most one-family house roofs will continue to require timber, though intercountry comparisons suggest that in several countries there is still scope for further reductions in use per unit.

Wood is also used more rationally today in ground-floors and interstory constructions, and though in one-family houses wood has fared better in first than in ground floors, further losses in both are likely. In multi-construction, timber's share is likely to diminish further.

How will current trends, if they continue, affect the future demand for sawnwood for structural elements in new housing? The foregoing discussion will have made it abundantly clear that the statistical material available does not admit of an intelligent forecast.

Nevertheless, it may be useful to consider certain assumptions which appear to accord with current trends and to examine their possible impact on requirements of structural timber in new housing. Suppose, for example, that the total European housing program (excluding the U.S.S.R.) were to expand by about half a million dwelling units by 1970, and that the proportion provided in multi-family blocks slightly increased. Then the total number of roof, ground-floor and interstory units would increase as follows in Table 11 (assuming an average of four stories for multi-family blocks):

Table 11. – Europe: Possible Trends in Housing, 1955 and 1970

Number of units	1955			1970		
	One- and two-family	Multi-family	Total	One- and two-family	Multi-family	Total
	in millions					
Dwelling units	1.13	1.05	2.18	1.30	1.40	2.70
Roof units	1.13	0.26	1.39	1.30	0.35	1.65
Ground-floor units	1.13	0.26	1.39	1.30	0.35	1.65
Interstory units	1.13	0.79	1.92	1.30	1.05	2.35

Making certain assumptions as to the proportion of each unit constructed of timber (percentages shown in parentheses), we arrive at the following estimates of the number of timber roof, floor and interstory units respectively required in 1955 and 1970 (Table 12).

If we now assume that the average *timber* roof in 1955 required 3.25 cubic meters and the average *timber* ground-floor or interstory unit 3 cubic meters in 1955,[7]

[7] These averages are, of course, higher than certain of those quoted earlier, which were averages for components of *all* dwelling units.

Table 12. – Europe: Estimated Numbers of Timber Roof, Floor and Interstory Units, 1955 and 1970

Unit	1955			1970		
	One- and two-family	Multi-family	Total	One- and two-family	Multi-family	Total
	in millions					
Roof	0.96 (*85*)	0.13 (*50*)	1.09	0.98 (*75*)	0.11 (*30*)	1.09
Ground-floor	0.34 (*30*)	0.03 (*10*)	0.37	0.26 (*20*)	0.02 (*5*)	0.28
Interstory	0.79 (*70*)	0.16 (*20*)	0.95	0.65 (*50*)	0.11 (*10*)	0.76

and that by 1970 these figures will have declined slightly to 3 cubic meters and 2.75 cubic meters, respectively, we arrive at the aggregates given in Table 13 for the consumption of structural timber in new housing.

Though, as already stressed, little credence can be attached to the absolute figures set out in this statistical exercise, their implications are of some interest. They suggest that a continuation of present trends, in so far as we have been able to decipher them, will lead to a further decline in the per-unit consumption of sawnwood for structural purposes in new residential construction. If the assumptions made in the foregoing paragraphs are realized, this decline may be of the order of 30 percent over the next 15 years. Should this happen, then even a substantial expansion in the European housing program (by half a million units) would still mean a lower aggregate need for structural sawnwood. On the assumptions which have been made here, this decline would amount to 1.5 million cubic meters.

TABLE 13. – STRUCTURAL WOOD NEEDS IN NEW HOUSING. 1955 AND 1970, ON CERTAIN ASSUMPTIONS

Need	1955	1956
	..... *in million cubic meters*	
Roofs	3.5	3.3
Groundfloors and interstories	4.0	2.9
Other structural timber	0.9	0.7
TOTAL	8.4	6.9
Per dwelling unit	*3.8 m³*	*2.6 m³*

THE SOCIETY OF AMERICAN FORESTERS AWARDS THE GIFFORD PINCHOT MEDAL

A unique event took place in the course of the last Conference of FAO. Simultaneously with the annual dinner of the Society in Syracuse, N.Y., members of the Society of American Foresters present in Rome gave a luncheon party for all the forestry delegates attending the Conference. In the course of the luncheon, on behalf of the Society, Dr. R. A. McArdle and Dr. V. L. Harper, Chief and Assistant Chief respectively of the U.S. Forest Service, presented the Gifford Pinchot medal for outstanding services in the cause of forestry to Mr. Henry E. Clepper, who has been Secretary of the Society for the past 30 years, Only four such awards have been made during the 50-year history of the Society. Our photograph shows (center) Mr. Clepper after having received the award. On his left is Mr. M. Leloup, Director of FAO Forestry Division, on the right Dr. McArdle, extreme right and left two of the outstanding Honorary Members of the Society of American Foresters of whom there are 12 in all, Professor Eino Saari of Finland and Professor Aldo Pavari of Italy.

Problems of Europe's Small Woodlands

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Two major solutions have been advanced for stepping up timber yields in Europe. First, there is the afforestation of bare lands, often derelict farmland or abandoned grazing land, and the creation of plantations outside the forest proper; secondly, increasing the output from privately-owned forests, particularly small woodlands, which, despite frequently more favorable conditions, generally yield far less, both in quantity and quality, than publicly-owned forests.

The important contribution which the typical small woodlands of Europe can make to timber production has been the reason why these have received so much attention from the European Forestry Commission during its last three sessions. It is at the request of the Commission that this paper has been compiled, based on the information and data that has emerged as the result of the Commission's discussions.

Definition of the Term

The concept of "small woodlands" covers at least three categories, and the problems involved are different, as are also the solutions:

1. *The farm woodlot.* Any wooded area which forms an integral part of a farm and which serves to provide for farm needs, whether consumed on the farm or in the home. Such woodlots are commonly used for purposes other than mere timber production or providing fences and fuel, such as livestock grazing, the collection of litter, gathering of fodder, fruits and leaves.
2. *Small woodland properties.* Wooded areas that vary in size from country to country but which are usually managed in order that they may yield incidental products for sale through trade channels.
3. *Industrial plantations.* A term used for plantations established outside the forest proper specifically to yield marketable products that will provide additional cash income to a farm or estate, or capital to pay, for instance, for extraordinary expenses or investments. Such plantations usually take the form of small groves or clumps and may consist of poplar, eucalyptus, robinia, etc.

The Table sums up the statistical data on small woodlands contained in reports made by member countries of the European Forestry Commission. It shows that it is not possible to gather properly comparable figures for various countries on the occurrence of private forests. This arises in part from the fact that statistical information that may be of interest for certain countries to collect, is of no interest to other countries. The Table, moreover, does not give a particularly clear picture of the fragmentation of forest areas. The figures are based on numbers of forest owners but, especially in certain countries of western Europe, the total wooded area belonging to a single owner is often split into many separate segments, which are often, located at considerable distances from each other.

Very small woodlands, say under five hectares or even under two hectares in area, are common in all countries of Europe. Added all together, they constitute in some countries an insignificant portion of the total forested area although in others they may make up quite a large proportion. In northern European countries, the size of small woodlands ranges from 20 to 30 hectares. In central and western Europe, the average falls, for instance, to 4 hectares in Austria and to less than 2 hectares in Germany and France. Along the Atlantic coast of Europe, industrial plantations occur side by side with the forest proper, as in the Netherlands, and have considerable importance. In southern Europe, the situation is rather confused. Privately-owned, small woodlands are of minor importance in Greece but very important in Spain, where they usually occur in concentrations. In Yugoslavia, they are badly fragmented. In Italy, small woodlands are of little consequence. However, in all these countries, industrial plantations, whether represented by rows of trees or small compact groves, are of high importance.

The Origin of Small Woodlands

The extent of privately-owned forest in relation to the total forest area in each country and the degree of fragmentation of private forests, arise from a nation's history and the established legal principles, particularly in regard to inheritance.

Broadly speaking, private forests derive from the breaking up of large estates (latifundia) of feudal origin which began after the Crusades and became greatly accentuated from the end of the eighteenth century. The persistence of latifundia in Spain and Italy probably

TABLE: STATISTICAL DATA CONCERNING SMALL WOODLANDS

Country	Total forest area	Private forest		Breakdown of private woodlands						Remarks
		Total area	Percent of total forest area	Forests under 2 hectares		Forests under 10 hectares		Forests under 50 hectares		
				Aggregate area	Percent of total forest area	Aggregate area	Percent of total forest area	Aggregate area	Percent of total forest area	
	hectares	*hectares*	*percent*	*hectares*	*percent*	*hectares*	*percent*	*hectares*	*percent*	
Austria	3 139 080	1 930 171	61	99 085	3	559 500	20	1 109 556	37	Average size of woodlands under 50 ha.: 4.5 ha.
Belgium	590 817	318 464	54	—	—	—	—	[1]70 000	12	Majority between 50 and 100 ha.
Denmark	437 593	273 920	62	—	—	—	—	100 000	23	Average size of woodlands between 5 and 50 ha.: 26 ha.
Finland	21 800 000	14 800 000	68	—	—	460 000	2	4 300 000	20	
France	11 400 000	7 300 000	64	—	—	2 359 000	21	3 780 000	33	Average size of woodlands under 10 ha.: 1.6 ha.; under 50 ha.: 2.5 ha.
Germany, Western	6 854 220	2 799 400	41	294 000	4	1 132 000	17	1 961 000	29	Average size of woodlands under 10 ha.: 1.8 ha.; under 50 ha.: 2.8 ha.
Greece	2 000 000	450 000	22	—	—	90 000	5	*200 000	10	
Ireland, Republic of	1 074 000	36 000	3	—	—	*18 000	2	—	—	
Luxembourg	85 100	50 925	59	—	—	*26 000	31	40 125	47	Average size of woodlands under 50 ha.: 1.9 ha.
Netherlands	250 000	156 000	62	—	—	80 000	32			*N. B.* - In addition, 48,000 ha. of row plantations, of which 30,000 ha. are privately owned.
Norway	7 500 000	5 753 000	77	Farm woodlots only: 3,604,000 ha. of 132,000 owners, of whom 66% possess less than 10 ha. plots. Average size of farm woodlot: 27.3 ha.						
Portugal	2 467 000	2 367 000	96							
Spain	24 669 006	16 790 848	68	Average size of private woodlands: about 16 ha. (but including large, non-wooded areas).						
Sweden	22 900 000	[2]11 600 000	50	—	—	—	—	4 101 000	18	See *1952 Yearbook of Forestry*
Switzerland	946 000	280 000	30	—	—	850	1	—	—	These 850 ha. (68 percent) belong to private owners. Average size of "peasant" woodlot: 1.5 ha.
United Kingdom *a*) Great Britain	1 535 000	1 140 000	74	—	*7	—	—	—	[3]*21	Average size of private forests: 183 ha.
b) Northern Ireland	26 300	11 200	43	Estimates do not include woods under 5 ha. in size. The average size of woodlands from 5 to 100 ha. is approximately 30 ha.						
Yugoslavia	9 694 000	2 202 000	23	Average size of private forests: 3-4 ha. Private forests cover 70% of the area of Slovenia.						

* Estimated figures. [1] Forests under 20 ha. in size. [2] Excluding company-owned forests. [3] Percentage of private forests.

accounts for the fairly large average size of private forest holdings in these countries. In northern Europe, large forest holdings are in the hands of influential guilds some of which date back to very early times. Where inheritance laws have led to fragmentation, not only are private woodlands of small average size, but each wood is fragmented into many small holdings.

The break-up of the feudal latifundia proceeded gradually. Usually the forests were abandoned to the villages or boroughs, the inhabitants of which already enjoyed usufruct rights. Where there was a strong community spirit, as in Switzerland and commonly in mountainous regions, the fragmentation ended there. Communal or collective ownership remains the practice in these areas and private property is comparatively of little importance. But elsewhere the forests were later divided up among the inhabitants, the laws at times prohibiting and at others favoring such fragmentation.

Agrarian structure takes shape either as a result of changes in economic conditions or through deliberate government action. The latter strongly affects both the total area of forests and their fragmentation. Recent examples of the expropriation of latifundia and the organization of farm settlements have often shown how any existing woodlands are made to disappear, and small private woodlots are not allowed to be re-established. On the other hand, such land settlement schemes may favor the establishment of row and hedge plantations and small copses. Population pressure resulting in such agrarian reforms does then lead to a constant diminution of larger woodlands and an increase of small woodlands. A similar tendency towards small woodlands occurs through fragmented marginal farmlands being abandoned to the growing of trees.

An interesting example is afforded by Finland where, as a result of the measures that had to be taken to resettle refugees from the area ceded to the Soviet Union after the last war, the proportion of farm woodlots in the total forest area for the country as a whole increased from 52.6 to 59.9 percent.

In all these cases, it is seen how forest policy, insofar as small woodlands are concerned, is linked to agricultural policy.

The Problems Involved

It must be recognized that some small woodlands are very well managed. Generally, however, woodlands that come under this designation do not produce either in terms of quantity or in quality, what might be normally expected.

It has been said that the size of individual, privately-owned, small woodlands varies considerably from one country to another, so that this lack of productivity cannot be attributed just to its smallness of extent, which is relative.

The smallness of a forest does of course present disadvantages, but the low productivity of small forests is due to other causes, equally valid for large forest estates and even extensive forests, whatever their type of ownership. These causes are lack of technical knowledge, of economic inducements and of financial possibilities to permit proper management. The small size of a woodland or its fragmentation merely accentuates these inadequacies.

A few comments on these three factors will later make more understandable the means that have been adopted by European countries to remedy the deficiencies of small woodlands, and perhaps even suggest others.

Inadequacy of technical knowledge

Sound management of a forest requires technical knowledge which, in the past, forest owners have generally been little prone to acquire and which governments, for their part, have been little concerned to provide. Obviously, the less the financial value of a small woodland, the less will the owner be disposed to acquire the technical knowledge necessary to proper management or to seek the advice of professional foresters. But it is essential that there be such qualified foresters available. It is a government responsibility in Europe to see that training facilities exist for extension foresters. The foresters taking care of State-owned forests cannot, at the same time, be expected to help manage private woodlands, and the experience of many countries suggests that large numbers of technicians are necessary in proportion to the area of private forests in order to secure proper management.

The same holds good as regards the development of industrial plantations. This is often an entirely new experience for landowners and technical assistance is essential to avoid failures and disappointments. However, if private forest owners are not interested in the management of their forests, the State-trained foresters may find themselves unemployed.

Economic considerations

Many farmers would undoubtedly be interested in acquiring the technical knowledge that would make their woodlots more remunerative, were it not that economic considerations require the woodlot to serve particular purposes: for instance, to supply fuelwood so that a coppice rotation is adopted or, in addition, to furnish extra grazing.

In Austria, where farm woodlots are highly developed, farm improvements are often financed from the timber, under conditions that are rarely beneficial to the stands. Definite overcutting has recently been reported in Austria because farmers wanted large cash sums to buy farm machinery. This is a common occurrence in many countries, and could perhaps be avoided by better co-ordination between agricultural and forest policy. For example, easy loans could be made available to farmers to be paid back gradually, so as to eliminate the need for overcutting standing timber. It is true that woodlands traditionally constitute a "savings account" for landowners, but too heavy inroads at

one time are not the way to ensure proper stand management.

However, it is especially nonfarming owners who are apt to regard their woodlands as money banks, and if a woodland is too small to furnish any substantial regular income, the temptation to overcut is even greater. Occasional small quantities of timber from such woodlands which sound silviculture might prescribe, are often difficult to sell and do not command good prices. Owners are therefore little inclined to invest substantial sums in improvements or access roads.

Economic considerations are foremost also in afforestation or tree planting. Tenant farming that does not guarantee the tenant long-term occupancy will not encourage him to invest in plantations. For lack of agreement between the landowner and tenant, afforestation may be impossible even if it would be economically profitable and the financial means for carrying it out were available.

Lack of finance

Even if owners of small woodlands would like to invest in forestry, they generally do not have the necessary money. And the smaller the woodland, the less cash for investment will it yield. Owners find it difficult to borrow any money on the basis of repayment from the income of their woodlands, and substantial sums are needed to pay for drainage, fencing, road construction, thinnings and stand improvements. New plantations entail substantial outlays.

In this regard, the farmer who owns a woodlot is usually in a somewhat better position as he can use some of his farm labor to tend his woods during the slack season. In northern countries, where the "dead" season from the agricultural point of view is particularly long, this has much importance. In addition to keeping on the land the manpower that would otherwise seek other occupations, the labor that the farm workers can put into the woods is a substitute for a cash outlay which, if it entailed having outside labor, would probably be considerable.

Forest Fragmentation

Proper management of small woodlands cannot be brought about merely by consolidation of ownership or by grouping separately owned properties into viable management units. It is necessary, in addition, to take measures to correct the lack of technical "know-how", economic inducements, and shortage of investment funds. This is a general situation. Even in the United States, where wooded areas several hundred hectares in area are termed small woodlands, owners are faced with the same difficulties as European owners of woodlots only a few hectares in size.

Correction of these difficulties must accompany specific correction of fragmentation.

No Government that belongs to the European Forestry Commission compels consolidation of fragmented forest holdings into single ownership, whether this be public ownership or a private association, or into suitable management units. But it must be admitted that useful results are difficult to obtain without recourse to compulsory powers.

It is fairly easy, by legislation, to stop further fragmentation of forest holdings. Legislation to this end has been introduced in several countries, for instance in Denmark (Law of 4 October 1919) where, incidentally, only woodlands over 10 hectares in area can hope to benefit from State aid; and in Germany, or at least in certain *Länder* of the Federal Republic. The French Law of December 1954 is of special interest, as a measure to check and reverse the trend toward fragmentation which is inherent in the inheritance laws. Formerly any co-owner of a woodland could at any time demand that the estate be divided up. Now, on the contrary, a single dissent against division is sufficient to oblige either the property to remain as an undivided holding or the compulsory buying in of the portions of the co-owners wishing to withdraw. The cost of this can be helped by loans from the National Forest Fund, repayable on a long-term basis.

In Finland, any fragmentation of the forested areas allocated to the farmers displaced from Karelia after the war was avoided by creating co-operatives in which was vested ownership of the forests involved. Shares in the co-operatives were apportioned to each farmer. When farmers need timber for their own use, they pay the value of this timber into the co-operative bank.

It is much more difficult to devise legislation which will encourage or secure consolidation of already fragmented forest holdings into single management or ownership units by voluntary action. Legislation often exists which does provide for this, but it is rarely called into operation. In Switzerland, for instance, there have been only two such cases in the last 50 years.

The law in several countries also provides for consolidation through agreed exchange and re-grouping of ownership of scattered plots. The main difficulty in such a procedure is the difference in type and quality of the woodlands to be exchanged between the interested owners. Consolidation along these lines appears to have been carried out systematically and with some success only in Switzerland. In 1956, 1,000 hectares were so consolidated, but the resulting individual forest units often do not exceed four to six hectares in area. Moreover, the regrouping operations involve putting in hand improvement works, especially road building, to enhance the economic value of the consolidated plots.

Consolidation can be brought about more easily where it is a case of areas to be afforested, because lack of uniformity in the plots does not then present the same difficulty. Here also, it is easier to effect consolidation by creating associations of owners who will be ready to contribute their land and pool their resources for the planting operations and subsequent management of the plantations as a complete unit. This system is adaptable in all European countries and forestry associations of this kind are already actively encouraged in some of them.

In some countries there is a natural trend, without State interference, towards consolidation of properties through purchase by societies, companies or investment agencies, often with a view to exploiting the value of the standing timber. This may or may not be a good thing. In some countries, notably France, the purchase of ownership titles with a view to the constitution of larger forest blocks is generally favored. In Sweden, consolidation of fragmented forest plots is encouraged in any form whatsoever; often certain organizations are legally granted priority rights in the buying of any land coming on the market, with a view to creating estates of better economic size. Some consolidation of woodlands may thus be achieved, but unfortunately the high price of forested areas has not as yet been conducive to much progress along this line. In Great Britain, co-operatives are being formed to bring certain lands under forestry. Owners of adjacent lands receive shares in the co-operatives, and it is possible to form quite extensive management units. Already some 10,000 acres belong to co-operatives of this type, and ready investment capital has been found.

The effects of agrarian reform on forest fragmentation have already been mentioned in this paper.

Improving Production

The list of possible measures that can be taken to increase production and improve yields from private forests is long. It might be divided into compulsory measures and technical assistance or incentives.

Measures of compulsion

This implies imposing restrictions on the freedom of action of landowners. Such measures are not generally viewed with favor but many governments have gone quite far in this direction. Some impose total restrictions over the clearing of woodlands and forest if the aim is to put the land to some other use. But no European Government, save in the case of three German *Länder* and, under certain conditions, Spain, requires private owners to adopt any prescribed system of management or working for their woodlands, though indeed some, for instance France and the United Kingdom, offer subventions to owners who will voluntarily conform to a management plan approved by the State Forest Service.

Between these extremes, there is a whole range of limitations applied in the various countries of Europe.

In Norway, Sweden and Finland, private woodlands must be managed according to sound silvicultural principles. What is meant thereby is quite clearly defined in regulations, especially in regard to ensuring the regeneration of cutover areas. There are slight differences in the regulations of the three countries but in general they are undoubtedly more strict than elsewhere. However, the restocking of cutover areas is also enforced in several other countries (Portugal and Switzerland, for instance) and some governments further make the afforestation of denuded land compulsory (Switzerland, for example, in the case of establishing protection forests; Yugoslavia, on land within forest reserves; and some German *Länder*).

Many governments only authorize cutting in private woodlands under license; in Yugoslavia, a forester of the State Forest Service has to mark the trees to be felled. In some instances, limitations on cutting apply only to protective woodlands or forests; such is the case in Spain (*regiones de interes forestal*), Italy (*vincolo forestale*), and France (*forêts de protection*).

In order to prevent the purchase of forests for speculative exploitation, the Danish law makes it compulsory to have a permit for all cutting that it is desired to carry out within ten years of the purchase. Under paragraph 6 of the Law of 11 May 1935, all land registered as forest land must be maintained properly stocked: all private woodlands are regularly inspected.

In all the *Länder* of Austria a felling permit is necessary for forests not under a management plan. It is proposed to make systematic forest management compulsory for all woodlands over 150 hectares in size, and in addition, to make it obligatory that all clearcut areas must be reforested within five years at most.

Another kind of compulsory measure imposed by certain governments, and notably in some German *Länder*, is to require that the timber cut from private woodlands be destined for specific end-uses, or else meet prescribed market specifications in regard to size and grade.

Technical assistance or incentive measures

These kinds of measures may be treated in the same order as given earlier in this paper.

Remedying lack of technical knowledge

Considerable progress has been made in this respect in recent years, either through direct government action or indirectly through government-supported forest owners' associations.

Two types of action may be distinguished, one aiming at giving direct instruction, if only of an elementary character, to woodland owners, and the other designed to provide the services of experienced foresters capable of giving advice and guidance or performing for owners operations that require particular professional skill.

An example of the first type is that adopted, for instance, in Austria where technical training is provided for both the sons and daughters of forest owners, and elements of practical education are also taught by provincial youth organizations. In Sweden, 3.5 million kroners are spent per year on courses, either by correspondence or direct instruction, for forest owners and workers. By the end of 1956, Finland had nine schools for the training of forest owners. France has recently opened a similar kind of school and proposes to pursue this policy further.

School forests have naturally a broader purpose but their role in educating forest owners and their children

Harmonious distribution of forest and private agricultural land in the Bernese Emmental (Switzerland). As a result of topographic conditions and comparatively recent colonization, all this region is divided up into isolated individual farms. The forests, with a high proportion of silver fir, are traditionally managed under the selection system. Their sustained yield is remarkably high.

Courtesy, Service Topographique Fédéral

must not be underestimated. Germany has about 1,400 such forests varying in size between three and five hectares. Here also there are two organizations operating to provide demonstrations of methods of felling, planting and execution of various types of forest work. Education through newspapers and journals is also markedly well organized; almost all farmers' magazines have a forestry section and many of them publish special forestry issues from time to time. Agricultural shows include forestry sections.

In Great Britain and France, considerable efforts are also made to educate forest owners through reading matter and publication of technical pamphlets. Switzerland makes particular provision for training technicians in timber grading and marketing so that they can, in turn, usefully give advice and help to private owners.

The second type of aid involves the furnishing of direct technical assistance to owners and this service is available in practically all European countries. In some, separate extension services have been established for this sole purpose and in the countries of northern Europe, for example, these are of long standing. In Austria, this type of assistance is rendered to small woodland owners by special forest services organized within the Chambers of Agriculture of the provinces. France has for several years had a Private Woodlands Service, and in Spain the Forest Service is to be reorganized to include, in particular, a forestry technical assistance or extension service.

The provision of personnel for such technical assistance services, not only for State services but also for various private associations, means that a considerable effort in training must be made. Once personnel have been trained and made available, their services must be used. In some countries, Germany for example, owners of forests over a certain size are required to make use of the services of professional foresters. Elsewhere, persuasion must be made effective.

Improving the economic situation of owners of private woodlands

Measures aimed at improving the economic situation of woodland owners so as to induce them to practise better management, undertake improvement works and carry out afforestation, are not peculiar only to small woodlands. The greatest incentive, of course, is proof that good forestry pays.

The maintenance of relatively high prices for standing timber and converted forest products is the best possible inducement to private woodland owners. Germany's 1957 report to the European Forestry Commission notes that timber prices are sufficiently high to allow most owners to dispense with government financial aid. High prices particularly favor the growing of quick-yielding species such as poplars, which can be integrated into normal farm management. It is not surprising that 6 to 8 million poplars were planted in Germany in 1956.

However, a deliberate policy to keep prices at a comparatively high level may, in the long run, rebound against the interests of forest owners. Many forest-owners' associations regard one of their main functions to be forcing prices of standing timber to the highest possible level, which can be harmful to industry. A report from Germany mentions that legislation is being introduced to curb such activities. It is the feeling of the European Forestry Commission, however, that close contacts between forest-owners' and wood-users associations or the trade are the best means of maintaining prices at reasonably remunerative levels and preventing dislocating fluctuations.

But there are other factors besides high prices. Many countries report that differences between "farm woodlots" and other private forests are tending to disappear. Electrification, improvement of roads and communications, easier availability of consumer commodities, encourage, for example, the use of fuels other than wood, or the replacing of wood fence-posts by electric fencing. The domestic demands on the farm woodlot decline and farmers look to producing higher grade products from their woodlands to bring in cash incomes. In the countries of northern Europe, it is considered that there should no longer be any difference in forest policy as applicable to public forests and to farm woodlots.

Technical progress in agriculture also has some effect on the possibility of improving management of farm woodlots. Rotation of forage crops, for example, makes it possible to dispense with or at least reduce grazing in woodlands, and also permits the afforestation of marginal pastures. The gathering of litter from the forest is seldom necessary as a practice anywhere at present. Agricultural workers' co-operatives provide training in forestry so as to make their members more versatile and employable at all seasons.

Financial aid

Providing financial assistance to forest owners is by far the most common method of inducing them to improve the treatment of their woodlands or to put in hand improvement works or plantings. This aid may be direct from the State but can also take the indirect form of promoting the setting up of owners' associations, mutual benefit societies, or the organization of credit facilities, all methods aimed at helping owners to help themselves.

Direct financial aid from government sources or through associations set up for the purpose, is general in Europe, and in most countries substantial amounts are allocated each year for such aid. Special agencies have been set up in various countries (Spain, France) to finance this type of aid, or else special laws have been passed (Finland, 1953). In this respect, Germany's Green Plan may also be mentioned.

Finland in 1956 spent nearly 3,000 million marks on the supervision of private woodlands and on assistance for improvement works and forest management; that is, nearly as much as the amount spent on the State

forests. In Sweden, special effort is put into the construction of forest roads, which receive subsidies covering from 50 to 80 percent of the cost depending on the individual cases and the region. Road projects are drawn up by specialists attached to district forest services and the actual work is performed by the farmers themselves, who often organize themselves into associations for road-building and maintenance. Two to three thousand kilometers of roads are being built each year.

Aid often takes the form of subventions or grants to owners who agree to observe certain silvicultural or management rules. The Dedication Scheme of the United Kingdom is a typical example. As a rule, the stricter the regulations and restrictions that are imposed on owners, the greater is the financial assistance accorded to them. There are countries, however, where substantial aid is given with practically no obligations required from the owner.

The form which financial aid can take varies. One of the oldest means is the reduction or temporary cessation of taxes on forested areas, or the application of a special tax schedule for owners of forests who undertake to conform to certain regulations. Such relief has often proved necessary because the tax load applied to forests, particularly as regards inheritance taxes, is frequently one of the main causes of the ruin of private woodlands.[1] In France, particularly valuable assistance is given to owners who would otherwise find it difficult to meet inheritance duties without overcutting their woodlands.

Often assistance takes the form of grants or subsidies; that is, the State participates directly, and makes non-reimbursable investments in work carried out under the responsibility and for the benefit of owners. Such grants may be in cash or in kind, for instance, in young plants or seed, and generally cover a large proportion of total cost. This, however, varies depending on the type of work. For plantings, in Spain, it is 50 percent of the cost of the work (with possible supplementary loans of 25 percent); in France, also, it is 50 percent. In Finland, it amounts to 60 percent and in exceptional cases to 80 percent; but the rate is calculated according to the financial means of the owners applying for grants, and in such a way as to favor owners of small woodlands. In the Netherlands and in Sweden, subsidies are granted to the value of 50 percent. In Switzerland, both the Confederation and the Cantons can make grants for afforestation work as well as for restocking of woods and land rehabilitation, fencing, road construction and the consolidation of fragmented woodlots.

The loan system is also widely practised, although to a slightly less extent than direct grants. The system is necessary because in the absence of special State-supported co-operatives or banking institutions, woodland owners or persons wishing to afforest their land, often find it very difficult to obtain the necessary credit. The amount of a loan which a Government is prepared to approve, varies with the extent of the program to be carried out. Usually the interest rate is low and repayment deferred or spread over a long period. In some countries, afforestation loans are recoverable only after the first fellings have been made in the planted stands. In the United Kingdom, although grants are limited to certain kinds of forest work, loans can be granted for all kinds of work likely to be carried out normally in forests, including the construction of roads and of homes for forest workers.

There are other methods of aiding landowners financially or even better to " help them to help themselves ". In some countries, at the request of owners and on payment of relatively small fees, the State authorities may entirely or partially manage private woodlands. Norway makes it compulsory for private owners to deposit a specific percentage of their returns from timber sales into a special bank account. This account is unblocked only when the forest owners wish to carry out specific improvement works, and they may then be authorized to withdraw the necessary amounts. This procedure, which has been started only recently, has worked well in practice and Sweden intends to institute a similar system.

A purely financial consideration that frequently deters private owners from establishing new plantations or giving their woodlands proper attention, is the fear of natural calamities — wind damage, insect and fungal attacks and, above all, fire, which in a few hours can destroy the fruits of many years of patient effort.

The situation as regards forest insurance in Europe is on the whole good. In the United Kingdom, owners can insure their woodlands against fire with one large private insurance company and several smaller ones. In fact, the Forestry Commission only makes loans where the interested owner insures his woods. The premiums are relatively small, provided that not only the blocks particularly susceptible to fire are insured but the total forest area belonging to the owner. However, there is no insurance scheme against wind damage, insect pests or disease.

In Denmark, owners can have their woods insured against fire either by regular insurance companies or by a specialized company which however covers only reforestation costs. Sweden has four or five specialized companies which for comparatively small premiums cover not only fire hazards but also insect infestation, wind damage and disease. All losses are covered, taking into account not only the present value of the standing timber but also its potential value. Finland is in an even better position, because owners can insure even against the risk of failure of new plantations. The Netherlands has two mutual insurance companies against fire, one for forests belonging to private persons and municipalities and the other, directly under the Forest Service, for municipalities only.

[1] The incidence of taxation has been dealt with thoroughly in publications of the Forestry Section of the European Confederation of Agriculture.

Role of Forest Owners' Associations

Forest owners' associations or co-operatives can play a role of considerable importance in solving the problems of private woodlands and small woodlands in particular.[2]

First of all, there can be wide flexibility in the form and mode of organization that such associations can assume, in keeping with the laws and customs of each country. Some forms of association provide only a very loose bond between members or only serve to help them in regard to one specific operation. Others provide for the pooling of the woodlands of all members for the purpose of management as single units, and so can compete with the guilds mentioned earlier in this paper.

The very nature of these associations implies that membership is voluntary. In a few countries, however, there is a tendency to make membership obligatory. In Germany, no new voluntary co-operatives in which the members pool their woods are being set up but those established earlier are still functioning and in two *Länder* the official services have the authority to create such co-operatives. In Spain, legislation now under consideration envisages the compulsory consolidation of woodlands into units of not less than 50 hectares each, and the compulsory setting up of owners' associations if demanded by over 60 percent of the owners concerned. The latter provision is common in many countries in the case of the formation of associations for a specific operations such as the draining of swamps and marsh land. In Finland, membership in a forest owners' association is not obligatory, but a law of 1950 requires all owners of forests with a theoretical timber yield of over 20 cubic meters per year, to pay a tax towards the support of such associations. In 1956, this tax produced nearly 600 million marks.

In many countries, forest owners' associations, created primarily for the purpose of enabling owners to sell timber from their woodlands at the best prices, soon tend to extend their activities to providing technical advice and material aid in forest management, and in fact to cover all phases of timber production. For example, the marketing co-operatives in Norway have appointed district forestry experts who have proved a great success in helping owners to plan their forest operations as well as to sell their timber. In central and northern Europe, many associations own sawmills. Some of them, like the major forest association existing in Denmark, undertake forest research, as certain Swiss associations have long been doing.

There are many services that such associations can render to governments. Probably the most important is that, especially at the local level, owners are made aware of the economic value of their woodlands both to themselves and in the broader context of the national economy. At the same time, the associations procure for individual owners facilities that governments could provide only through considerable expenditure of public funds or at a cost higher than legislative bodies could be expected to authorize.

Further, since local associations are frequently grouped into regional and then national bodies, they constitute channels through which government authorities can, on the one hand, explain the purposes of national forest policies to private owners in order to secure their collaboration and, on the other hand, sound out the general views of forest owners and obtain their reactions to proposed official measures.

Because of this, many countries have set up bodies composed of forest owners or on which owners are fully represented, to be of service to national forest departments. Usually, these bodies have only an advisory function as, for instance, the Forestry Council of the German Federal Republic. Some governments, however, vest them with responsibilities in connection with forest regulation and management, witness the case of the Forestry Board established in 1954 in the Netherlands.

There is also a marked trend to give even local associations a certain amount of responsibility in the enforcement of state regulations imposed on private owners. This is an excellent way to foster the prestige and standing of such associations and to ensure that they acquire as large a membership as possible. It is usually through the intermediary of such associations, where they exist, that state subsidies are planned, allocated and distributed.

Future of Private Woodlands in Europe

The large forested areas under private ownership throughout Europe entail difficult problems for governments in the matter of the implementation of national forest policies. The relevance of private forests to such policies has often not been fully understood until fairly recently, but now responsible authorities are concerning themselves more and more with the matter.

Means have been gradually devised to provide owners, even of small woodlands, with considerable help towards sound forest management. However, there is still much progress to be made. Exchange of information between countries on methods employed and the degree of success secured, will help to bring this about. The study tour on "the development of rural woodlands" organized by Austria in 1956, and which took the participants also to Bavaria, Alsace, Lorraine and Switzerland, is good proof of this, and represents a useful way of disseminating the benefits of experience.

At its ninth session in 1957, the European Forestry Commission recommended to member countries that this sort of exchange of information be further developed. It further decided to give continued attention itself to developments in the matter of small woodlands, through reports rendered by Member Governments.

A number of specific recommendations were made to governments along the lines set out in this paper,

[2] FAO published in 1956, in *Unasylva*, Volume 10, Number 2, a comprehensive paper on forest owners' associations.

and there were two points on which the Commission laid special emphasis:

1. The need for governments to co-ordinate their national agricultural and forest policies, and to effect as close co-operation as possible between agricultural and forest services advising farmers.
2. The fullest use of all forms of associations, syndicates, co-operatives or societies, to avoid further fragmentation of forest holdings and encourage the consolidation of existing fragmented holdings into economic units; to make private forest owners understand the economic value of their woodlands and instruct them in the essentials of good forest management; and, finally, to provide technical and financial assistance so that owners may fully exploit the productive capacity of forest soils, both in regard to quantity and quality of production, and gain remunerative money yields from their forest crops.

Translated from an original French text

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Shootborers of the Meliaceae

FAO Staff

Comments on this note will be welcome, and readers are invited to submit to the Forestry Division of FAO brief notes, not over 1,000 words, on the occurrence of injurious insects and diseases which are important on an international scale, the damage they cause, and control measures.

Attack by shootborers on the *Meliaceae* such as *Swietenia, Khaya, Lovoa, Cedrela, Carapa* and *Entandrophragma* is common in all tropical countries. It causes considerable damage to plantations in varying intensity among individual countries and regions. Young plants from 2 years on are attacked, but also trees 10 to 20 years are often damaged in later years. The insect is a small lepidopterous pyralid of the genus *Hypsipyla*, of which there are three species worth mentioning: *Hypsipyla grandella* in America, *Hypsipyla robusta* in Africa and Asia, *Hypsipyla albipartalis* in Uganda. It generally lays its eggs on young shoots at the base of the leaf petioles, and in northern India it is found on the fruits of *Cedrela toona*. The larvae, which penetrate immediately into tissues, are sensitive to insecticides for only a very short time, probably not over several hours. They hollow out the young shoots for a length of about 60 centimeters and can even attack several shoots. The cycle lasts from 4 to 10 weeks, beginning in the rainy season, with a minimum of two generations per year. However, less severe attacks may occur during the entire year.

Damage is very important and has caused considerable losses which limit large-scale planting of the *Meliaceae* in tropical countries. Such damage appears to be greater on *Cedrela* than on *Swietenia* in Latin America, and greater on *Swietenia macrophylla* than on *Swietenia mahogani* in plantations in Indonesia. The damage consists of death of the young terminal shoots, considerably retarding growth, and results in the formation of numerous secondary shoots causing twisted and unthrifty trees. This, however, does not cause the death of the entire tree. The following figures can be cited: in Puerto Rico from 1935 to 1943, one million *Cedrela* and 835,000 *Swietenia* trees were damaged; and, at Tingo Maria in Peru, 60 percent of the *Cedrela* and 10 percent of the *Swietenia* were attacked over the same period.

Control is particularly difficult in view of the short duration of the external life of the larvae. Chemical treatment seems to be limited, until now, to forest nurseries. In Peru, a 0.5 percent DDT solution or a lead arsenate paste, and, in Malaya, DDT solutions have been used. In plantations, only silvicultural measures have been employed. The problem is very complex and although many methods have been recommended, none have proved satisfactory until now. These methods consist generally of avoiding use of too close spacing or pure plantations, and of choosing favorable site conditions which will permit the tree to pass quickly the stage at which attack is most likely to occur. A certain degree of cover should be maintained because the development of the insect is favored by light. However, in the latter case the gauging of the light is difficult in view of the need of the *Meliaceae* for sufficient light for development; excessive shade has been blamed for numerous plantation failures.

A parasitic Ichneumonid (*Calliephialtes*) has been mentioned in Puerto Rico; in India, 11 parasites have been found; the most important (*Trichogramma minutum*) lives on the eggs of *Hypsipyla robusta*. But until now no adequate study has been made of the biological control of *Hypsipyla*.

Cedrela in Latin America

Plantations of *Cedrela mexicana, C. odorata, C. fissilis, C. lilloyi*, and *C. tubiflora* all appear to have been attacked by *Hypsipyla grandella*, particularly the first two mentioned species, which are well known. This pest is associated with poor drainage of the soil or sunscald of the collar, which renders the plant susceptible to attack by a buprestid. Frequent heavy failures are expected in most plantations leading either to limiting planting to exceptionally favorable terrain, as in Trinidad, or even in certain cases abandoning such plantations altogether.

To combat this disastrous situation, Holdridge (1943) advises for the Caribbean area the planting of a maximum of 60 trees per hectare on carefully chosen sites. He notes that *Hypsipyla grandella* does not tolerate shade but as it can reduce the growth of *Cedrela*; he thinks that it is better to plant in full light in the hope that the young widely-spaced plants on particularly favorable sites will be able to resist the insect by passing quickly through the susceptible stage.

Cater (1945), in Trinidad, considers that a 50 percent cover is better and that *Cedrela* plantations should be made on deep well-drained soils. Calcareous clay appears to give the best results. In addition, cover impedes growth of competing vegetation. He suggests planting on mounds, at 100 trees per hectare.

In countries where Latin-American *Cedrela* has been introduced, they have been similarly attacked. This is true in Ghana; in Nyasaland, however, they seem to have suffered less from this insect.

Cedrela toona and C. toona var. australis

Originating in Asia and Australia, these species are susceptible to attacks of *Hypsipyla robusta* in all countries where they have been planted. In Ceylon and India, it is recommended that *Cedrela toona* should not be planted on sites where *Hypsipyla* has occurred on other *Meliaceae*. This precaution, which is considered more important even than soil and climatic conditions, thus limits the attacks. It is also recommended that close planting be done with persistent shade from above or wide planting with shade from the sides. It has been observed that the predators of *Hypsipyla* are found on the shading trees and other vegetation, bringing appreciable competition against the insect. In South India and in Ceylon, the insect does not occur on *Cedrela toona* or *Swietenia* at elevations above 1,600 meters. In Australia, research made on *Cedrela toona* var. *australis* points to a race which appears to be more resistent to *Hypsipyla*. Success has already been obtained with grafts of this variety of *Cedrela toona*.

Swietenia macrophylla, S. mahogani and other American Meliaceae

Although damage is common, the Philippines report that their plantations are still free from attack. In Malaya, also, damage is insignificant. Huguet and Marie (1951), in the French Antilles, indicate that attacks are associated with poor soil, excessive insolation and wind. They suggest that plants be protected by leaving brush to grow among the planted trees for lateral protection and to produce a mixed plantation on rich well-screened terrain. In Martinique, *Hypsipyla* also attacks *Carapa procera, Cedrela odorata, Khaya senegalensis*, and *Guarea trichiloïdes*. The authors point out that the presence of *Carapa* permits the development and extension of *Hypsipyla* to Surinam and to Trinidad.

In Trinidad, it is reported that attacks are less strong than on *Cedrela*, and mixed plantations are recommended, as in Puerto Rico. The influence of shade is confirmed in a report of the Tropical Forest Experiment Station in Puerto Rico, which suggests that shade ought to reach 50 percent.

Swietenia plantations outside their native country are attacked equally, as in India for example. In Java, it is planted in mixture with other species. *S. macrophylla* is more resistant than *S. mahogani*.

Another of the *Meliaceae*, *Carapa guianensis*, is often attacked in Brazil.

Khaya and other African Meliaceae

Here also damage is common. Aubréville (1947) notes particularly the attacks on *Khaya ivorensis, Entandrophragma cylindricum*, and *E. angolense* in the Ivory Coast. He suggests favoring maximum growth of plants to escape the attack of the insect as rapidly as possible. In Nigeria, Butler (1952) reports that the attack is reduced when the plants receive lateral protection. He discovered that there is another borer, probably a Cerambycid which, in Ghana, attacks the young stems of isolated trees. It is advisable to use *Sarcocephalus diderichii* as a screen tree.

In the Belgian Congo, *Khaya anthoteca* is slightly attacked by a shootborer.

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Commodity Report

Sawn Softwood

The steady postwar increase in the world production of sawn softwood was halted for the first time in 1956. Output declined from 51.01 million standards in 1955 to 50.48 million in 1956. World exports also fell, from almost 6.9 million standards in 1955 to 6.2 million in 1956. The decline was primarily concentrated in North America and Europe, both of which regions are highly developed industrially and economically: elsewhere, production and trade remained more stable, and the steady growth of output continued in the Soviet Union.

The developments in North America and western Europe which were the main reasons for the falling volume of world output and trade were these. Industrial production and building activity, which in countries of both regions since the war had either shown a steadily rising trend or else been maintained at a relatively high level, began to show signs of weakening. The annual rate of growth in industrial activity was 5 percent from 1955 to 1956, as against 9 percent from 1954 to 1955 in western Europe and 3 percent as against 12 percent respectively in the United States. House building, one of the most important sectors in sawnwood utilization, showed a decline in both regions during 1956, although industrial construction, a less important wood consumer, seems to have fared better in that year. These developments, together with increasing anti-inflationary measures, gradually reduced the current demand for sawn softwood.

In 1957, the situation on the world sawn softwood market changed slightly. The volume of international trade increased, notably for Europe, whereas the volume of world output seems to have remained more or less unchanged. A further reduction in the production of sawn softwood in North America and Europe was compensated, at least to some extent, by an increase in Russian output. It seems also that the volume of output in Latin America and Asia, as well as in Africa, has slightly risen from the 1956 level.

The following regional reviews give a more detailed account of developments and problems.

North America

In 1955, total sawn softwood consumption in the United States reached some 17.3 million standards, a level second only to the all-time high of 1950, and over one million standards more than in 1954. Production had followed the rising demand and had reached 16 million standards, as against 14.8 million standards in 1954. Imports, mainly from Canada, amounted to 1.7 million standards, as against 1.45 million in 1954. Exports, on the other hand, showed only an insignificant rise, from 283 thousand standards in 1954 to 315 thousand standards in 1955. The result of increased output and imports was, that despite rising consumption demand, stocks of sawn softwood in the United States at the end of 1955 were slightly higher than a year earlier. In 1956, however, consumption fell by about 1 million standards, production by somewhat less, and imports dropped only slightly. Consequently, stocks at the end of 1956 showed another increase in the course of the year to about 3.1 million standards, as against 2.7 million a year earlier. Production in 1957, although at a reduced level, has so far been greater than effective demand. The reduced rate of house building activity, which has been lower than in any year since 1949, brought down the demand not only for construction wood and millwork, but also for flooring and to some extent, furniture. The continuous surplus of supplies and the relatively weak consumption demand in 1957, therefore, led to accumulation of stocks and further cuts in output. The situation can be illustrated by Table 1:

TABLE 1. – UNITED STATES: SAWN SOFTWOOD MARKET
(in million standards)

	1954	1955	1956	1957 Jan.-Aug.	Percent change from Jan.-Aug. 1956 [a]
Production	14.79	15.96	15.17	9.50	— 9.5
Shipments	15.05	15.90	14.80	9.60	— 7.5
Orders received	20.28	15.92	14.73	9.60	— 6.7
Unfilled orders (end period)	0.91	0.85	0.73	0.72	— 0.3
Gross stocks (end period)	2.66	2.72	3.10	2.96	+ 5.1
Imports	1.45	1.69	1.59	0.60[b]	— 20.0[b]
Exports	0.28	0.32	0.28		
Index of general industrial activity (1953 = 100)	93	104	107	108	+ 1.9
Building activity, non-farm dwelling units started (millions)	1.22	1.33	1.11	0.60[c]	— 11.8[c]

a) Twelve-month period, to January-August, 1957.
b) Estimated, January to June.
c) January to July.

The United States market developments naturally were felt strongly in Canada, whose exports account for roughly one half of the country's total sawn softwood production. The decline in Canadian building activity,

which took place towards the end of 1956 and also in 1957, gradually reduced domestic demand and led to a certain surplus of supplies. A further factor which influenced the Canadian export of sawn softwood in 1956 and 1957 was the situation in Europe. In 1954 and 1955, the volume of exports to this region had remained at about 450,000 standards, a level more or less normal for Canada's postwar exports to Europe. In 1956, however, because of Europe's heavy general curtailment of purchases (see section on Europe), Canadian exports to this region fell to 250,000 standards. Although in 1957 demand revived, export possibilities were handicapped by excessive ocean freight rates and the volume of shipments to Europe during the first half of 1957 showed a further decline from the level reached a year earlier (Table 2).

Table 2. – Canada: Sawn Softwood Market
(in million standards)

	1954	1955	1956	1957 Jan.-June	Percent change from Jan.-June 1956 [a]
Production	3.64	4.03	3.78	1.71	– 10
Total exports	2.10	2.38	2.04	0.87	– 13
of which to:					
United States	1.47	1.71	1.59	0.66	– 14
Europe	0.45	0.44	0.25	0.10	– 26
Stocks (end of period)	0.47	0.46	0.52	0.57	+ 24

a) Twelve-month period to January-June, 1957.

The less favorable market for Canadian sawn softwood is illustrated by the fact that despite a noticeable decline in both production and export shipments, stocks at the end of June 1957 were 24 percent higher than twelve months previously.

At the time of writing it is not possible to trace how the North American market has developed later in 1957, but it is assumed that production was further curtailed in order to bring stocks down.

Europe

In 1955, there was a record demand on the European market for sawn softwood. Industrial activity as well as house building was still rising steeply and, in anticipation of a continuous strong consumer demand, the volume of both production and trade reached new postwar heights. Towards the end of the year, the rate of growth in industrial activity started slowing down, and the effect of various measures taken by most European governments to counter inflation, mainly in the form of credit restriction and dearer money, began to be felt by the trade.

At the beginning of the purchasing campaign for 1956, the European timber trade, particularly the importers, were faced with less satisfactory consumption prospects than had been anticipated while, at the same time, heavy stock holdings created an increasing financial burden. It became evident that a considerable downward adjustment of stocks was necessary, and purchasing for 1956 started slowly and with caution. The volume of trade for the whole year showed a marked reduction from the level reached a year ago. Consumption, however, taken as a whole, apparently did not change markedly in the course of the year, despite the fewer housing starts and slower rate of growth of industrial activity in many countries. The result was a significant decline in the volume of stocks held by the trade.

By the end of 1956, a healthier starting position had been created for the 1957 season, and new supplies for 1957 could be assumed to correspond rather closely to expected effective consumer demand. In fact, after the weakening recorded in 1956, the European sawn softwood market showed a firmer tendency in 1957, with more stable conditions prevailing. Imports by European countries in 1957 are expected to have exceeded the 1956 volume of trade by 200 to 250 thousand standards and to have amounted to some 3.7 million standards.

The increase in imports during 1957 will have been primarily due to larger purchases by the United Kingdom (about 130,000 standards more than in 1956) as well as by both Western and Eastern Germany (together about 100,000 standards more than in 1956). Other European countries are expected to have imported approximately the same volume in 1957 as in the preceding year.

The relatively brisk demand in 1957 evoked an adequate response from the European exporters. Shipments from all the principal exporting countries appear either to exceed the volume exported in 1956 or else to show only a small decline. In the case of Austria, where earlier a heavy reduction of exports had been envisaged for 1957, the continous availability of storm-felled timber led to the postponement of the reduction in production and exports planned as a result of the analysis of the forest inventory recently concluded in that country. On the other hand, the elasticity of supplies in northern Europe has been in part due to the steady trend towards the transport of logs by road, instead of floating, which facilitates the speedy procurement of logs by the sawmills when the need arises. Flexibility in production potential is also afforded by the existence of thousands of small sawmills which operate only when market conditions are favorable and contribute to the ability of northern European exporters to adapt their supplies rapidly to changing market demand. Furthermore, particularly in the case of Sweden, the steady growth of the domestic market has brought about an increase in the stocks normally held at different levels of the trade. This permits a greater mobilization for export when shippers are confronted with a sudden rise in demand.

The increased exports by Finland in 1957 and the probable maintenance of the 1956 volume by Sweden,

Table 3. – Sawn Softwood Market in Europe [a]
(in thousand standards)

	1954	1955	1956	1957 Jan.-June	Percent change from Jan.-June 1956 [b]
Production, total	*10 560*	*11 130*	*10 940*	*5 280*	— *5*
of which:					
Austria	804	826	839	417	— 0.7
Finland	1 019	1 074	920	431	— 4.6
France	907	1 018	1 006	364	+ 6
W. Germany	1 263	1 399	1 487	620	— 18
E. Germany	643	613	591	282	— 1.4
Poland	1 327	1 346	1 320	738	+ 2
Sweden	1 600	1 750	1 600	..	..
Imports, total	*3 420*	*3 790*	*3 310*	*1 470*	+ *23*
of which:					
W. Germany	517	609	502	248	+ 34.7
Italy	354	351	377	197	+ 2.5
Netherlands	383	400	389	162	+ 45
United Kingdom	1 481	1 709	1 290	539	+ 15.4
Exports, total	*3 100*	*3 290*	*3 000*	*1 400*	*21*
of which:					
Austria	704	675	733	353	— 0.9
Finland	729	779	635	252	+ 18
Sweden	937	1 067	1 010	474	+ 38
Stocks of sawn softwood					
Importing countries [c]	1 090	1 300	1 140	960	— 4.3
Exporting countries [d]	1 040	1 120	1 070	..	..

a) Excluding U.S.S.R.
b) Twelve-month period, to January-June, 1957.
c) Belgium, Denmark, Western Germany, Netherlands, Switzerland and the United Kingdom.
d) Austria, Norway, Poland, Sweden and Yugoslavia.

however, have been achieved through a rather heavy depletion of stocks of both logs and ready goods, production of sawn softwood in both these countries in 1957 showing a further reduction from the volume recorded in 1956, which was already lower than that of a year earlier. Maintenance of the 1957 export volume in 1958 appears therefore somewhat unlikely. In the case of Finland, it should be noted that already in 1956 the sawmills had depleted their current stocks of ready goods and that new log supplies in 1957 were smaller than those normally required by current production.

Trade between the countries of eastern and western Europe shows an interesting development. The former (excluding the Soviet Union) gradually seem to have reduced their export availabilities in sawn softwood, while a steady increase in the volume of imports is observed. Production of sawn softwood in these countries has remained practically unchanged during the past years, with the exception of Eastern Germany where output seems to have fallen from 750,000 standards in 1950 to under 600,000 standards in 1956. At the same time domestic requirements for sawnwood have risen rather rapidly. Hence a decline in export availabilities and a rise in imports. It seems possible that the volume of exports will decline further in the coming years, whereas imports will rise even more rapidly than in the past two or three years. The contribution of the eastern European countries to sawn softwood supplies in western Europe, which in the prewar period had been considerable, may therefore gradually decrease in importance (Table 4):

Table 4. – Sawn Softwood Trade between Countries of Eastern [a] and Western Europe
(in thousand standards)

	1953	1954	1955	1956	1957*
Exports by eastern European countries to the west	143	230	232	193	220
Imports by eastern European countries from the west	10	17	50	77	100

* Estimated.
a) Czechoslovakia, Bulgaria, Eastern Germany, Hungary, Poland and Romania.

The Soviet Union, on the other hand, despite the steady rising home requirements, has been able steadily to increase its exports to the west, while at the same time supplying considerable quantities to the countries of eastern Europe. The production of sawn softwood in the Soviet Union since the early postwar years has risen from 5.95 million standards in 1948 to 13.82 million standards in 1956, an increase of 23 percent. Soviet exports to countries of western Europe also rose from 55,000 standards in 1948 to 393,000 in 1955, and 370,000 in 1956 while imports from western Europe fell from 96.000 standards in 1948 to 51,000 in 1956. Table 5 illustrates the development of sawn softwood production in the Soviet Union as well as its trade with countries of western Europe.

Latin America

In Latin America, the sawn softwood market can be characterized as being composed of a large number of relatively small local markets. In most countries, the volume of both production and trade is relatively insignificant. Some countries, such as Honduras and Nicaragua, export most of the sawn softwood produced, although the volume of output is relatively small. Others either have a sufficient national production to meet the small domestic demand, or they import minor quantities. The only two countries with an important output of sawn softwood are Mexico and Brazil. In Mexico, however, practically the whole production is consumed on the home market, Brazil being therefore the only large-scale Latin-American supplier of sawn softwood on the international market (either intraregional or overseas). The development of sawn softwood production and trade in Latin America and the share of the most important countries is illustrated by Tables 6 and 7.

Table 5. – Soviet Union: Production and Trade of Sawn Softwood
(in thousand standards)

	1948	1949	1950	1951	1952	1953	1954	1955	1956
Production *	5 950	7 780	9 010	10 190	10 910	12 000	12 550	13 750	13 820
Exports to western Europe only	55	132	182	136	132	222	276[a]	393[a]	370
Imports from western Europe only	96	60	18	62	122	71	67[b]	53[b]	51

* Estimated.
a) Total declared exports: 1954, 373,000 standards; 1955, 498,000 standards.
b) Total declared imports: 1954, 135,000 standards; 1955, 103,000 standards.

Table 6. – Latin America: Sawn Softwood Production and Trade
(in thousand standards)

	1950	1951	1952	1953	1954	1955	1956
*Total production * of which:*	*960*	*1 160*	*1 070*	*1 040*	*1 050*	*1 120*	*1 090*
Brazil	560	746	760	717	748	794	750*
Mexico	250	242	169	165	165	163	165*
Honduras *	40	45	50	45	45	50	50
Chile	22	23	15	27	24	27	30*
*Total exports * of which:*	*320*	*330*	*240*	*300*	*280*	*340*	*240*
Brazil	175	229	137	198	162	238	136
Honduras	15	21	29	28	32	40	40*
Chile	15	13	7	13	22	21	20*
*Total imports * of which:*	*200*	*300*	*200*	*210*	*240*	*320*	*280*
Argentina	134	217	115	89	100	179	136
Uruguay	..	..	23	..	38	30*	30*
Venezuela	7	..	12	14	17	25	25*
Mexico *	5	4	16	18	17	21	20
Peru	10	16	15	19	..	14	15

* Estimated.

Table 7. – Trade in Sawn Softwood between Latin America and Other Regions
(in thousand standards)

	1952	1953	1954	1955	1956
Exports to North America	66	62	57	53	38
Imports from North America	84	77	87	102	103
Exports to Europe	35	70	75	80	45
Imports from Europe (a)	7	5	12	45	15
Exports to Oceania	1	7	6	4	4
Exports to Africa	1	2	1	1	1

a) Including eastern Europe and the Soviet Union.

Exports by Latin-American countries to North America come primarily from Mexico and Brazil to the United States. Imports from North America go chiefly into Mexico, other Central-American countries, Peru and Venezuela. Exports to Europe, Oceania and Africa, come almost entirely from Brazil; from other countries, mainly around the Caribbean sea, only minor quantities are exported to Europe.

As to imports from Europe, practically all go to Argentina and Uruguay and come from the traditional European exporting countries. Exports by the Soviet Union and countries of eastern Europe to Latin America have somewhat increased during recent years.

Africa

Africa is predominantly a softwood importing region, and the only important domestic production is in the Union of South Africa. The volume of the region's imports has varied with changes and fluctuations in the international political situation and in the economic activities of individual countries. Algeria and Morocco, together with Egypt, traditionally account for about 50 percent of Africa's total imports, the Union of South Africa alone accounting for the other 50 percent. In recent years, however, the increasing domestic output

Table 8. – Africa: Sawn Softwood Production and Trade
(in thousand standards)

	1950	1951	1952	1953	1954	1955	1956
*Total production **	*110*	*110*	*130*	*130*	*150*	*150*	..
of which:							
Union of South Africa *	44	47	50	54	63	60	..
*Total imports **	*330*	*370*	*300*	*260*	*280*	*300*	*290*
of which:							
Union of South Africa	105	140	113	103	116	134	108
Egypt	133	132	60	48	41	44	26
Algeria	35	53	..	47	50	35	52
Morocco	24	..	30	33	33	32	25
Tunisia	9	11	7	7	8	8	7

* Estimated.

of sawn softwood here has tended gradually to reduce import requirements. The volume of imports by Algeria and Morocco seems to have remained relatively stable during the past years, but political and economic changes have led to considerable fluctuations in Egypt's imports of sawn softwood. Thus, for instance, in 1956, the volume of imports amounted to only 26,000 standards, as against 44,000 in 1955 and 41,000 in 1954 (Table 8). Imports from western European countries have been considerably reduced and in certain cases seem to have reached a complete standstill. On the other hand, imports from the Soviet Union and other countries in eastern Europe show a significant rise. Whether this development continues or not, depends largely on the balance of payments and foreign currency situation.

It seems probable that the region's total volume of imports will gradually rise. The rapid economic and political progress of many countries will no doubt call for greater supplies of sawn softwood and as long as the domestic resources remain at their present low level, the needs will have to be met by imports.

Asia

For the purposes of this report, figures are given for Asia as a geographical unit. On this basis, the volume of sawn softwood production has shown a spectacular increase during past years, due mainly to the rising output in Japan and in mainland China. After having been below 3 million standards in 1948, production amounted to over 5 million standards in 1956.

Table 9. – Asia: Sawn Softwood Production and Trade
(in thousand standards)

	1950	1951	1952	1953	1954	1955	1956
*Total production **	*3 280*	*3 430*	*3 680*	*3 620*	*3 780*	*4 430*	*5 060*
of which:							
Japan	2 415	2 500	2 743	2 631	2 734	3 285	3 937
China *	310	400	480	600	740	750	760
Turkey	43	65	59	79	80	142	110
*Total imports **	*130*	*160*	*160*	*230*	*210*	*210*	*190*
of which:							
Israel	53	55	42	41	45	55	45
Turkey	14	11	36	67	70	34	10
Japan	1	6	5	27	12	17	18
Iraq	..	3	8	12	14	11	13
Lebanon	7	7	7	8	10	11	16
Syria	10	7	4	4	5	7	10

* Estimated.

Japan is the only major exporter and exports have, during the past years, been directed primarily towards the Pacific Islands, notably Okinawa and recently, to a certain extent, to South Korea.

Countries of the Near East account for close to 70 percent of Asia's total imports, the rest being divided between Japan, South and North Korea and Mongolia.

Imports by Near East countries are traditionally from the principal European exporting countries: Finland, Sweden, Austria, Yugoslavia and Portugal, boxboards in particular coming from the last-named.

Turkey drastically cut its sawn softwood imports from all sources in 1956. This situation also continued in 1957.

The significant strengthening of the position of the Soviet Union, Romania and Yugoslavia on the Near East market in 1956 and 1957 has in part been the result of high maritime freight rates rendering excessive the cost of shipments from northern Europe and North America.

Oceania

Production of sawn softwood in this region rose slightly in 1956. Imports, on the other hand, which in 1955 had shown a marked increase, recorded a fall in 1956. In that year, sawn softwood output in Australia was somewhat higher than in the preceding year, although in New Zealand production declined slightly. The decline of imports into Australia in 1956 was primarily due to restrictions imposed on import quotas during April and October 1955, the effect of which was felt towards the beginning of 1956. The dock strike early in 1956 also delayed imports in the first half of that year. Demand in Australia seems, however, to have been slackening towards the end of 1956 and in 1957, at the time of writing, has so far not shown signs of strengthening (Tables 10 and 11).

Prices

International prices have in general shown little change in 1956 and in 1957. The f.o.b. quotations of the leading European shippers after having declined slightly in the course of 1956 remained remarkably stable in 1957. C.i.f. values, however, fluctuated more. Maritime freight rates for timber shipments remained relatively high throughout 1956 but fell sharply in 1957, reaching in August the lowest point since 1954. Domestic prices in Europe have, by and large, followed the trends of the international market. In the United States, the heavy decline in demand during 1956 led to a relatively great fall of domestic prices and also influenced Canadian prices which declined until the end of 1956, at which

TABLE 10. – OCEANIA: SAWN SOFTWOOD PRODUCTION AND TRADE
(in thousand standards)

	1948	1949	1950	1951	1952	1953	1954	1955	1956
Production:									
Australia	92	103	92	108	126	117	139	140	164
New Zealand	213	227	248	270	269	268	289	292	280
Imports:									
Australia	80	117	130	202	126	79	128	161	126
New Zealand	4	8	5	7	10	3	8	11	7
Exports:									
New Zealand	11	12	7	11	8	10	17	22	18

TABLE 11. – IMPORTS OF SAWN SOFTWOOD INTO OCEANIA
(in thousand standards)

	1948	1949	1950	1951	1952	1953	1954	1955	1956
From:									
North America	53	76	63	99	84	62	100	130	98
Europe	19	32	57	89	32	5	12	17	12
Latin America	2	6	8	14	10	6	7	4	5

TABLE 12. – SAWN SOFTWOOD PRICES

	1955	1956				1957					
	Dec.	March	June	Sept.	Dec.	Feb.	March	April	May	June	July
Sweden: average export price for 2 ½ – 7 in. u/s redwood battens, f.o.b. (Kr. per std.)	1 210	1 220	1 190	1 170	1 185	1 195	1 190	1 190	1 195	1 190	1 190
United Kingdom: average price c.i.f. of imported sawn softwood (£ per std.)	85.40	83.93	83.43	83.92	80.17	81.14	85.65	83.04	84.05	83.23	82.08
United States: wholesale price for Douglas Fir No. 1 common 2×4 in., (U.S. $ per 1,000 bd. ft.)	88.1	89.3	89.2	85.1	80.7	80.9	80.2	80.9	80.2	80.2	80.8

TABLE 13. – TIMBER FREIGHT RATES – TRIP CHARTER
(United Kingdom Chamber of Shipping Index: 1953 = 100)

1953	1954	1955	1956				1957							
			Jan.	April	July	Oct.	Jan.	Feb.	March	Apr.	May	June	July	Aug.
100	114	177	183	167	211	185	181	172	182	178	177	148	147	—

period they seemed to have stabilized. Tables 12 and 13 illustrate the development of certain important world prices of sawn softwood during 1956 and 1957.

Table 14, although incomplete, gives some information for Brazil as a whole as well as for certain principal exporting regions.

TABLE 14. – BRAZIL: AVERAGE MONTHLY EXPORT VALUES OF PARANÁ PINE
(values expressed in cruzeiros per cubic meter)

Year	All Brazil	Paraná	Santa Catarina	Rio Grande do Sul
1955				
Jan.-June	..	1 350	..	..
Jan.-Aug.	1 500	..	..	..
September	1 610	..	..	..
November	1 650	1 070	..	..
December	..	1 600	..	..
WHOLE YEAR	1 680	..	..	..
1956				
January	..	1 900	..	..
February	2 250	2 200	2 050	..
March	..	..	2 100	..
April	2 220	..	1 910	..
May	..	2 170	..	..
August	3 000	..	..	..
September	2 900	2 540	2 650	3 040
October	2 460	..	..	..
November	2 640	2 380	..	2 920
December	..	2 400	2 550	2 830
WHOLE YEAR	2 500	..	..	..
1957				
January	..	2 390	2 520	2 980
February	..	..	..	2 850
March	..	2 370	2 530	..
April	..	2 160	2 470	..

Towards the end of 1957, the general price situation continued stable and prospects for 1958 seem by and large to justify confidence in further price stability. In Europe, a further tightening of credits in some of the principal importing countries and the possibility of certain cuts in their import programs for 1958 might exercise some pressure on international prices. On the other hand, rising costs of production and labor in the principal exporting countries, as well as the high cost of raw materials — a substantial rise in log prices was in fact recorded in the Finnish auctions in autumn 1957 — tend to indicate that, in the event of falling demand, producers would rather cut production than lower the existing export price levels. As to North America, the fall of sawnwood prices seems to have been halted by the autumn of 1957, as the sawmilling industry adapted its output and stocks to the prevailing lower demand.

Conclusion

In 1957, world consumption of sawn softwood showed practically no change from that in 1956. In Europe and North America, the level of *per caput* consumption has been falling — in North America even the total volume of consumption declined in 1956 and 1957. In other regions of the world, although total consumption of sawn softwood seems to have risen somewhat, *per caput* consumption has only risen a little or else been more or less maintained. It might appear as if the rate of sawnwood consumption has reached its ceiling in the more developed regions and might decline gradually. In the less developed regions, however, the rate of sawnwood consumption is still very low and should, therefore, continue to rise slowly.

E. K.

CORRECTION

The Swedish Wallboard Association have drawn attention to errors in the data relating to consumption levels of fibreboard in Sweden as given in the Commodity Report on fibreboard contained in *Unasylva* Vol. 11, No. 3, 1957. During the periods 1948, 1952/53 and 1954/54, the data indicated should be corrected to read respectively: 21.8, 19.5, and 20.0 kilograms per head.

(NOTE: This correction also affects data given in Table 4 of the Commodity Report on particle board contained in *Unasylva*, Vol. 11 No. 4, 1957).

The Work of FAO

Ninth Session of the FAO Conference, 1957

The high standard of the debates and discussions, the realistic and dynamic approach to the problems confronting FAO, and the spirit of international solidarity in attacking these problems — these were the characteristics of the Ninth Session of the Conference of FAO which was held at Rome from 2 to 22 November 1957.

More than 550 delegates and observers attended the session including 25 Ministers or Secretaries of State. Forestry interests were well represented and the list of delegates who participated in the discussions of the Conference's technical committee on forestry is given at the end of this report.

The Conference voted a working budget of $17 million for the two years 1958 and 1959, a considerable advance over the funds that the Organization has hitherto had for its regular program of work, and representing a remarkable display of confidence in the Director-General, Mr. B. R. Sen. As he expressed it, the extra funds approved injected a new vitality into the affairs of FAO.

> " Despite the uncertainties and failings all around us, our world today is one of undreamt hope and challenge, if only we can husband and develop the natural and human resources properly, taking the fullest advantage of the technological advances in different fields. Toward meeting this challenge, our Organization must contribute its best. "

Three additional countries were admitted to the Organization, Ghana, Malaya and Poland, bringing the total membership of FAO to 77 countries. A firm strengthening of the regional structure of FAO was approved, and the creation of a new Regional Office for Africa was agreed.

World food and agriculture situation

The Conference had before it the Director-General's report on the *State of Food and Agriculture - 1957*, together with his supplementary review of recent developments and a review of the current commodities situation. It endorsed the general analysis of the current situation and outlook as presented in these documents.

Planning for the three rural industries — farming, forestry and fisheries — could be effective only when done as part of a general economic development program which gave adequate attention to the balance between urban and rural industries, and between each of the three in the latter group. Farming, forestry and fisheries had technical interrelations, partly competitive, as in demands for the use of land, water, capital and, sometimes, manpower, and partly complementary as in conservation aspects, in use of rural manpower, in combined resource developments, or in mixed individual farm/forestry enterprises. The Conference felt that these interrelationships must be given full weight in agricultural planning.

The Conference stressed that national programs of forest development which did not take into account the intentions and interests of other countries might lead to a serious waste of the country's own resources, while also hampering the growth of international trade and over-all economic development. Many countries maintained that the move away from international or regional specialization and division of labor towards greater national self-sufficiency was a major cause of present difficulties in world markets for some products. While it was recognized that a country's production should be based on its comparative advantage in soils, climate and other factors, it was pointed out that this was a static conception which did not take account of changing levels of efficiency and of the need for expansion in existing and new lines of production. Furthermore, reasons of national security, balance of payments and other difficulties, and the need to sustain a healthy and increasingly diversified domestic agriculture often dictated a greater measure of self-sufficiency than was warranted by purely economic considerations.

Many countries emphasized the inadequacy of the capital available for investment in forest development. This applied both to government funds for investment and to the supply of credit to individual forest owners to enable them to improve their efficiency. It was recognized that all countries must accumulate capital for development from their own limited resources, even if at times this meant temporary reductions in consumption. Many countries stressed, however, that a larger supply of international funds was needed for investment in forestry, and some considered that FAO should take positive action in this matter. In addition, current public budgets for agricultural ministries and other government services to farming, forestry and fisheries were unduly low in many underdeveloped countries, and needed to be materially increased if public services to rural industries were to be consistent with the importance of these industries to employment, national income and economic development.

The Conference stressed the need to pay greater attention to the human and social factors involved,

both in planning and in introducing improved techniques and measures of economic assistance. It was not sufficient to provide the farmer or forest owner with merely the physical means of increasing his production. Social measures were also necessary to improve rural conditions. More rapid improvement would be possible if the enthusiasm and help of rural populations themselves could be more widely enlisted in over-all programs of community development. In some countries, this had been effective in imparting a new impetus to rural development.

An important factor in agricultural and forest productivity was the establishment of sound patterns of land use. Improved knowledge of the capacities of the natural resources was, therefore, important for working towards optimum patterns of land use. In some countries, existing patterns had their roots in historical conditions which had, for instance, resulted in the more fertile areas and those more suitable for cultivation being used on an extensive basis, largely for livestock raising, while arable farming was confined to forested areas and the areas with the least favorable topography and carried out under conditions of heavy pressure of population on land, with holdings of uneconomic size.

Resource conservation also required major land use adjustments, such as the withdrawal of marginal land from arable farming to grazing or afforestation. Potentially productive forest lands in many areas were rapidly deteriorating as a result of uncontrolled grazing or of burning under shifting cultivation practices.

The Conference considered that careful studies were needed in the whole field of productivity and on agrarian reform in relation to productivity.

It was noted that excessive fragmentation of producing and processing units raised specific marketing problems in the field of forestry. These could be met by the adoption of appropriate handling techniques and co-operative organization.

Activities and Programs of FAO

The Conference reviewed FAO's work in forestry since 1955 by means of a technical committee under the chairmanship of Richard E. McArdle, Chief of the United States Forest Service, and with P. Martinez Hermosilla, Director-General of the Spanish Forest Service, as Vice-Chairman. It considered that FAO's objectives and work had become more widely known and understood at all levels in member countries. This helped to give impetus to national efforts towards forestry development.

The Conference felt that the Director-General was to be specially commended for the emphasis placed on the many sided interrelationships between forestry and agriculture, and for his insistence on the ways in which forestry could contribute to the well-being and incomes of rural populations and forest workers.

One development which had specially proved its merit over the past years was the organizational machinery represented by the Regional Forestry Commissions and other subsidiary bodies. The Conference asked the Director-General to take into account the views of these Commissions when preparing future programs of work and budgets of the Organization.

The Conference commended the organizing of the World Eucalyptus Conference in 1956 and expressed the hope that another conference along the same lines might take place. It was glad to note the work proposed on tropical pines and strongly supported holding a study tour on Mexican pines. The part played by the International Poplar Commission in developing new sources of raw materials and protective services to agriculture, was appreciated. The work of this Commission, as well as that of the International Chestnut Commission, should be continued.

The Conference was glad to note the progress made in the case of the Latin-American Forest Research and Training Institute in Venezuela, and with the Regional Forest Research Center and Forest Rangers' School for the Near East in Syria. The organization of the Training Center on Watershed Management in India in 1957 was pointed up as an example where a regional project could afford training to better advantage than a national project.

In discussion on FAO's phased program of timber trends studies for the various regions of the world, the Conference agreed that the closeness of the regional forecasts of requirements and consumptions in the European study to the data now available on the actual course of events, furnished supporting grounds for continuing these analytical studies.

The Conference hoped that the Director-General would take appropriate steps for co-ordinating the forestry statistics of FAO with those compiled by countries of the British Commonwealth.

In general, the Conference commended the quality and amount of FAO's achievement in the forestry field, especially in view of the smallness of the funds available.

Program of work, 1958/59

The Conference adjudged the Director-General's whole proposed program of work in forestry for 1958 and 1959 which will absorb 14.3 percent of the technical funds and 8.5 percent of the whole FAO budget, to be well proportioned and balanced between the various technical and also regional claims. The Conference commended the pruning of projects undertaken in 1956 with a resultant concentration of effort.

The Director-General's interim report on *Mediterranean Forestry Programs in Relation to Agricultural Rehabilitation and Economic Development* and his proposals related to this project were the subject of discussions in which representatives of many member countries took part. Suggestions were made regarding aspects to be stressed more fully. These included a number of technical problems requiring further study, in particular costs of establishment and maintenance of new forests, selection of species, choice of proper tools and equipment and techniques in general, which were regarded as

being matters of importance. The delegates also stressed the desirability of establishing and implementing specific projects. The Conference was assured that the technical comments made in the discussion would be fully considered in any further work to be undertaken.

With regard to other major expansions proposed by the Director-General in his program of work, the Conference regarded as of the highest priority the strengthening of the regional staff structure to support FAO's forestry activities in the field under the technical assistance program and to service the regional forestry commission and their subsidiary bodies. It noted that the regional approach has always been basic to FAO's work in forestry; it should be continued and strengthened. Extension to Africa should be introduced at the earliest possible opportunity.

The Conference regarded the holding of a conference of pulp and paper experts in the Asia and Far East region, as proposed by the Director-General, as indispensable to promoting such industries and forestry development in general in that region. This had been already acknowledged by the Asia-Pacific Forestry Commission and by the United Nations Economic Commission for Asia and the Far East.

On the subject of documentation, the Conference rated the publications of FAO in the forestry field as of high importance. Consequently, it was strongly felt that ways and means must be found to reduce the present backlog of publications and to prevent such accumulations in the future.

The Conference reviewed the work of FAO in the field of watershed management, commended the results already obtained and accorded high priority to continued collaboration between the Agriculture Division and the Forestry Division concerning this and also the subject of shifting cultivation, which constitutes a major problem in catchment area protection. It endorsed, in particular, the following projects:

a) Organization of a study tour in the U.S.A. for the study of what has been accomplished in that country and of the research work being carried out. Member countries should include requests for Fellowships for this study tour in their 1959 programs of Technical Assistance.

b) Reinforcement of the co-operation between agriculturists and foresters in Europe and the Far East through the organization of joint meetings of regional FAO bodies interested in watershed management and over-all land-use planning. It was indicated that there is a need, in particular, for an improved definition of the scope of the work of those bodies and of their interrelations.

c) Organization of regional centers on watershed management, utilizing the opportunities afforded by the Technical Assistance Program.

d) Preparation of a technical manual on watershed management, giving due recognition to the different problems faced under widely varying physical and economic conditions.

The Conference urged again that special attention be given to co-ordination of watershed management work between national authorities and technicians where the catchment area is shared by two or more countries.

Program trends

While agreeing that the Organization's present main lines of activity in forestry should be maintained, the Conference suggested for the future some shift of emphasis toward projects which have as goals increased forest production at reduced costs and improvement of the living standards of rural populations. The latter objective can be attained only through steady efforts to teach people how to make the best use of the natural resources on which they must depend. FAO can contribute through wider promotion of forest extension services and increased participation in community development movements.

More emphasis should also be laid in future programs on activities leading to a wider application in member countries of modern silvicultural practices, for instance, in the tropical regions now being developed. Attention should be focused also on the origin and quality of forest seeds and a comparative analysis be made of the pertinent legislation on this matter in various countries and of the results so far obtained.

The Conference recognized that wood is meeting increasing competition from alternative materials. Action should everywhere be promoted to reduce costs, improve utilization, create better marketing organizations. The efforts of FAO in these directions should be expanded.

Fifth World Forestry Congress

The Conference recorded its gratitude to the Government of the United States of America for having assumed the responsibility of organizing the Fifth World Forestry Congress to be held at Seattle (Washington) from 29 August to 16 September, 1960. It was also pleased to hear that the Government of Canada would be glad to arrange field trips to British Columbia either prior to the opening of the Congress or after its conclusion, if requested.

A number of useful suggestions were made by delegates in regard to the organization and program of the Congress for the consideration of the Organizing Committee to be set up by the Government of the United States of America.

List of Participants

Members of the Technical Committee on Forestry were:

Afghanistan:	X. Abdullah, Plant Protection Laboratory, Kabul
Australia:	K. Cook, Australian Legation, Rome
Austria:	O. Eckmüllner, Director of Forestry, Styria
Burma:	U Aung Baw, Conservator of Forests

CANADA:	A. L. Best, Chief, Forest Economics Section, Federal Forestry Branch
DENMARK:	N. B. Ulrich, Chief, of Forest Service
FRANCE:	J. de Vaissière, *Inspecteur général des eaux et forêts*
FINLAND:	E. Saari, Professor of Forest Economics, University Forestry Department, Helsinki
GERMANY:	K. H. Oedekoven, *Landforstmeister Bundesministerium für Ernährung, Landwirtschaft und Forsten, Bonn*
GHANA:	A. Foggie, Chief Conservator of Forests
HAITI:	R. Ambroise, *Directeur, Service de conservation du sol et des forêts*
HONDURAS:	R. Torres Fiallos, *Director, General de Recursos Naturales* R. Castillo Matute, *Jefe Departamento Forestal, Dirección General de Recursos Naturales* R. Clare-Andino, *Jefe Departamento Técnico Forestal*
INDONESIA:	Soesilo Hardjo Prakoso, Head of Directorate of Forestry and Land-Use Planning, Djakarta
IRAN:	N. Golesorkhi, Technical Adviser to the Ministry of Agriculture
IRAQ:	H. Kittani, Acting Director-General, Directorate General of Forestry
ISRAEL:	A. Y. Goor, Director of Forests
ITALY:	A. M. Camaiti, *Direttore Generale per l'Economia Montana e per le Foreste* L. Funiciello, *Ispettore Generale delle Foreste*
MOROCCO:	Ch. Grimaldi d'Esdra, *Inspecteur général des eaux et forêts*
NETHERLANDS:	J. H. Pott, Directorate International Organizations, Ministry of Agriculture, Fisheries and Food
NORWAY:	A. Löchen, Secretary-General, National FAO Council
PHILIPPINES:	Eugenio de la Cruz, Director, Forest Products Research Institute, Laguna
PORTUGAL:	F. J. Mendes Frazão, *Directeur général des services forestiers* J. L. Calheiros, *Voçal Commissão* FAO
SPAIN:	P. Martinez Hermosilla, *Director General de Montes* R. de Rada, *Ingeniero Jefe de Relaciones, Dirección General de Montes* J. de Luque, *Ingeniero Jefe de Planificacion, Patrimonio Forestal del Estado*
SUDAN:	K. Hamad, Acting-Director, Forest Department
SWEDEN:	F.L.H. Johansson, Director-in-chief, Royal Board of Private Forestry
SWITZERLAND:	J. Keller, *Inspecteur fédéral des forêts*
TUNISIA:	M. Badra, *Chef du service des forêts*
UNION OF SOUTH AFRICA:	A. J. Du Plessis, Principal Technical Officer, Department of Agriculture
UNITED KINGDOM:	Sir Henry Beresford-Peirse, Deputy Director-General, Forestry Commission
UNITED STATES:	R. E. McArdle, Chief, Forest Service, U.S. Department of Agriculture V. L. Harper, Assistant Chief, U.S. Forest Service and Head of Forestry Research H. Clepper, Executive Secretary, Society of American Foresters C. G. McIntire, Congressional Observer, U.S. House of Representatives
VIET-NAM:	Lam-van-Thanh, *Directeur des eaux et forêts, Saigon*
YUGOSLAVIA:	D. Klepac, *Professeur à l'Université de Zagreb*

Observers were also present from Unesco (P.C. Terenzio, Director-General's Office) and IUFRO (A. Pavari, Director, Forest Experiment Station, Florence).

ZON BIOGRAPHY

Mr. E. N. Munns, Chairman of the Society of American Foresters Committee on Forest History, is collecting material on which to base a biography of the late Dr. Raphael Zon. It would be greatly appreciated, therefore, if copies of any material concerning Zon and his activities, including correspondence, could be sent to Mr. Munns at 1639 Garnet Lane, Concord, California, U.S.A.

Equipment Section

Double Wedge Bundling Hook. — End of cable is doubled back through small wedge wound around bundle and pulled through, tapping large wedge into position making a secure positive lock. To release, large wedge is simply backed off.

Steel and Iron Foundry Ltd., 16 West 3rd Avenue, Vancouver 10, B.C., Canada.

Mounted Transplanter No. 550. — Fits over almost all tractor models; follows contour of ground and handles all transplantable crops and tree seedling setting. Adjustable pack wheels give tight soil seal. Furrow depth regulated by depth control lever. Left wheel operates self-cleaning water valve adjustable to release the proper amount of water for various plant sets. One or two 55-gall. (208 l.) water tanks can be mounted on tractor. Plants can be spaced from 8 in. to 55 in. (20 cm. to 140 cm.).

Optional features: scraper that controls height of ridge, assures even planting depth. Long marker bars available providing row spacing up to 6 ft. (1.83 m.). Deep furrow opener available.

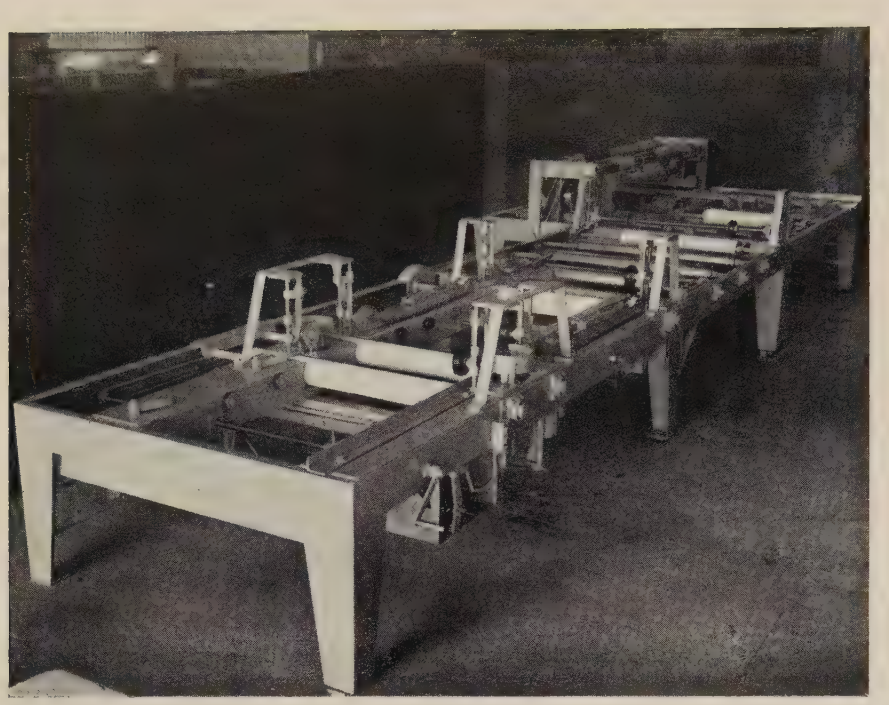
New Idea Farm Equipment Company, Coldwater, Ohio, U.S.A.

Speed Swing Loader. — Has 180° boom swing and various attachments. Used for loading, transportation, draining ditches and clearing roads. *Specifications*: 4-wheel drive, planetary axles, 3 speeds fwd., 3 rev., 4-wheel steer optional, bucket, fork, crane hook; 18 ft. (5.5 m.) boom extension; fully hydraulic control; gas engine — Chrysler 90 hp; diesel engine GMC 77 hp; overall height without cab 9 ft. (2.7 m.); width overall 8 ft. (2.4 m.); length overall 22 ft. 4 in. (6.8 m.); wheel base 9 ft. (2.7 m.); ground clearance 1 ft. 2 in. (36 cm.); bucket capacity 1 $^1/_4$ cu. yds. (0.96 cu. m.).

Pettibone Mulliken Corporation, 4700 W. Division St., Chicago 51, Illinois, U.S.A.

Ransome Stumper. — Stumper model R 100 can be easily attached and detached in few minutes. Used with blades of 35 in. to 52 in. (89 cm. to 132 cm.) in height. Operating depth 18 in. (46 cm.). Weight 900 lb. (408 kg.).

Ransome Corporation, 2729 Hunting Park Avenue, Philadelphia 29, Penn., U.S.A.



Merton Two-way Loader. — Equipped with hydraulic control. The height at which the material is discharged can be varied according to requirements.

Prime mover is Fordson Major four cylinder diesel engine rated to develop 44 b.h.p. at 1,700 rpm. Petrol or vaporizing oil engine can be supplied as alternative as requested on order.

Standard bucket size $^{7}/_{8}$ cubic yard (0.67 m³) for ordinary materials. Output per hour 100 cubic yards (76.5 m³).

Specifications: Overall length bucket on floor 14 ft. 6 in. (4.40 m.); overall height over cab 7 ft. 9 in. (2.35 m.); overall width 6 ft. 9 in. (2.10 m.); weight with fuel, oil and water 6 tons.

Merton Engineering Company Limited, Faggs Road, Feltham, Middlesex, England.

Fork Truck with Four-wheel Drive. — 20,000 lb. (9,070 kg.) capacity pneumatic-tire fork truck with four-wheel drive and finger-tip direction controls. Designed for heavy duty in mud and over rough terrain. Four-speed, power shift transmission and torque converter with 3-1 multiplication coupled with 143 hp General Motors diesel engine. Gasoline engine optional. Four-wheel or two-wheel drive obtained by moving selector lever. Single lever on steering column controls lifting and tilting movements.

Specifications: Underclearance 14 in. (36 cm.); speed 25 mph (40 km/h) both fwd. and rev. Turning radius 312 in. (7.92 m.). Wheelbase 108 in. (2.74 m.). Length (less forks) 207 in. (5.26 m.). Empty weight 32,470 lb. (14,730 kg.). Tires 14 in. × 24 in.

Industrial Truck Division, Clark Equipment Company, Battle Creek, Michigan, U.S.A.

Kval No. 440 BD. — Used for automatic edging and sanding both sides of doors and panels and then automatic double trimming to length in one continuous movement through machine. Only infeed operator and off bearer necessary. No operator between edging and trimming process.

Used in manufacture of doors and in connection with panels and other similar stock. Pre-hung door concerns use this equipment to advantage. Capacity 250 units per hour.

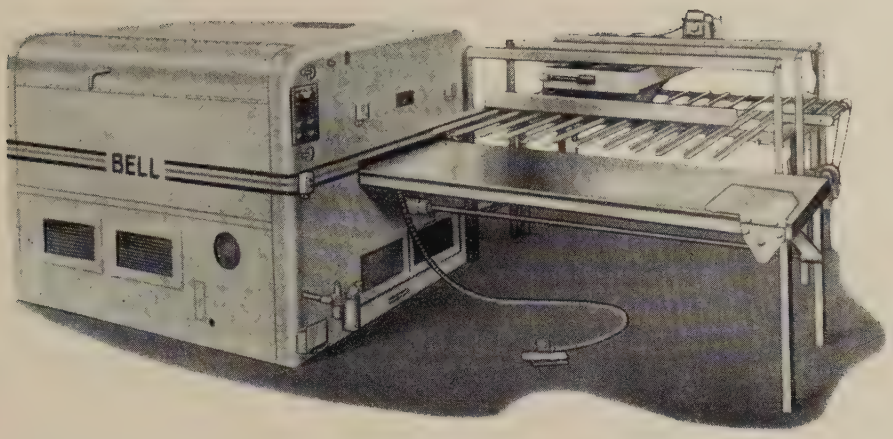
Kvalheim Machinery Company, Petaluma, California, U.S.A.

Kajaani Ditcher. — Used in Finland for draining forest areas and swamps. Wings consist of two sections, outer wings (detachable to reduce transport width) push excavated dirt away to prevent it dropping back into ditch. Two floating plates on back of ditcher reduce sinking when used on swamps and minimize towing resistance, also act as skids (inclination adjustable). Front end rests on rubber-tired axle assembly.

Pulled by tractor size Caterpillar D6 or D7 equipped with towing winch. As direct pulling with a tractor tends to break surface, especially on soft swamps, towing ditcher with winch advisable.

Specifications: Overall dimensions: length 4.92 m. (18 ft. 2 in.); width with spreading wings 3.5 m. (11 ft. 6 in.); tread 1.8 m. (6 ft. 2 in.); tires (2) 13 in. × 28 in., 6-ply.

Oy Witraktor Ab, Helsinki-Lento, Finland.



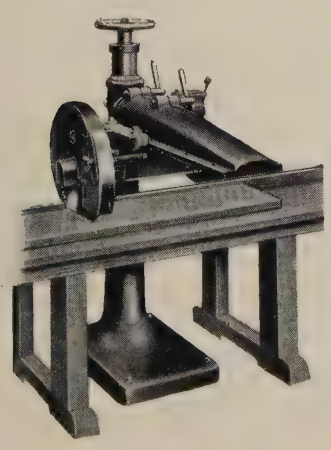
BELL 300 ELECTRONIC EDGE GLUER WITH BELL 333 CONVEYOR-TRANSFER GLUE SPREADER. — Cycle of operation automatic, begins when operator presses foot lever. This actuates ram which conveys laid-up stock into press. Top platen pressure equalized giving uniform parallel movement and pressure. Top and side pressures maintained until the operator again presses foot lever. This opens press and feeds in new press load which has been assembled on lay-up table while former load was being cured. This incoming load pushes cured load out of press.

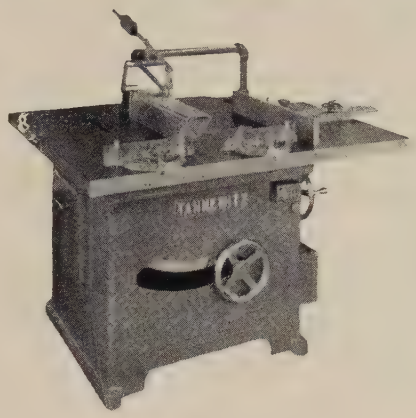
The Bell Machine Co., Oshkosh, Wisconsin, U.S.A.

FESTO RADIAL SAW TYPE SM. — Serves for cutting to length bevel cuts, mitre cuts, tenoning, notching, edging, grooving, etc.

Specification: 4 hp three phase motor, 2,800 rpm, swings and tilts, 5 ½ in. (140 mm.), vertical movement 18 in. (450 mm.), blade-height of cut 6 in. (150 mm.), width of cut 28 in. (700 mm.), weight approx. 594 lb. (270 kg.) with automatic telescoping guard. Special attachments available.

Festo-Maschinenfabrik G. Stoll, Esslingen a.N., Germany.





TILTING ARBOR SAW BENCH. — *Specifications*: Size of one-piece main table, 43 in. × 45 in. (109 cm. × × 114 cm.). Table expands for 4 in. (10 cm.) dadoes. Ripping capacity, 28 in. (71 cm.). Cutting off capacity with gauges, 30 in. (76 cm.). Size of arbor where saws are applied, 1 in. (2.5 cm.). Largest saw possible, 20 in. (51 cm.). Automatic plastic guard over saw. 5 hp saw bench motor. One 16 in. (41 cm.) diam. cross cut saw or rip saw provided. Net weight 1,600 lb. (726 kg.). Additional equipment available.

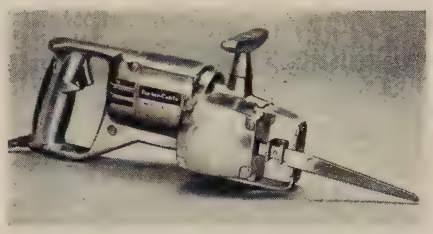
Tannewitz Works, 301-325 Front Avenue, Grand Rapids, Michigan, U.S.A.

CUT-OFF SAW No. 606. — Compact, ram type, air-operated, cut-off saw designed for continuous use in furniture production lines, millwork and other woodworking plants. 7 ½ hp motor available. Stroke actuated by depressing foot-operated push button. One push will cause ram to take predetermined stroke and return. Speed of out-stroke adjustable by operator. 16 in. (41 cm.) diameter saw blades furnished as standard. Floor space required 21 in. × 44 ½ in. (53 cm. × 113 cm.). Net weight 960 lb. (435 kg.).

Ekstrom, Carlson and Co., Rockford, Illinois, U.S.A.

HOMELITE EZ CHAIN SAW. — 5 hp direct drive. Weight 19 lb. (8.6 kg.). All-angle diaphragm carburetor allows cutting in any position. Available with 12, 17, 21, 25 and 30 in. (30, 43, 53, 63, 76 cm.) guidebars, integral cooling fan, water- and dust-proof ignition and ball bearings on shaft and pinions.

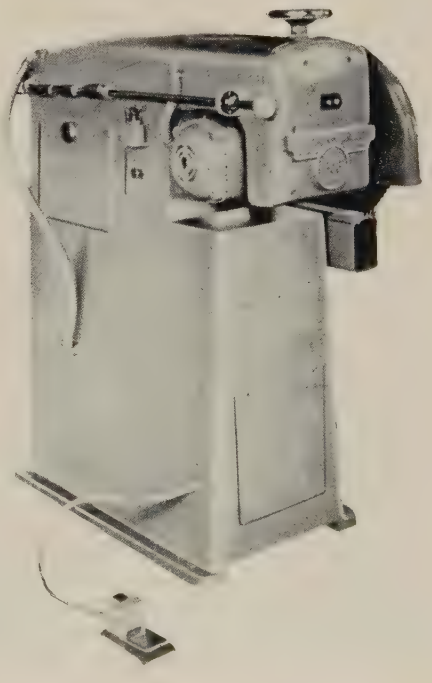
Homelite, 75 Riverdale Avenue, Port Chester, N.Y., U.S.A.



MULTI-SAW. — New multiple-purpose saw designed especially for contractors, carpenters, builders, industrial maintenance crews etc. for cutting hard or soft wood, aluminum, ferrous and nonferrous metals in sheets or tubing, fiber-board, etc. Eight blades available.

Specifications: Weight 6 ½ lb. (3 kg.). Aluminum die cast housing. 3.5 amp motor idles at 4,500 strokes per min. and cuts at 4,250. 230 volt model available.

Porter-Cable Machine Company, Syracuse 8, N.Y., U.S.A.



News of the World

Borneo

• The appointment of a forest botanist to Brunei State raised the problem of recruiting tree-climbers from among the Ibans, a Sarawak people, of whom a few are settled in Brunei State though many come up from Sarawak in search of work.

Tropical evergreen rain forest is hot and wet and oppressively closed in, slippery underfoot, full of thorns cunningly concealed in the undergrowth, and of a variety of troublesome creatures—among which leeches and sandflies share top place.

In this environment the Iban is perfectly at home. He can make dug-out canoes and pole or paddle them up the rivers (the only means of communication) with great skill. He can slip out at night with a gun and torch and hunt the wild pig and deer. There are two main methods which he uses in climbing trees. The first, for big isolated trees such as the *tapang* on which the jungle bees often build their honeycombs, consists in constructing a ladder up the bole of the tree by driving in sharpened bamboo stakes at intervals. This takes the best part of a day.

Otherwise, the monkey-on-the-stick technique is followed. Bare feet are pressed flat against the bole, knees bent and stuck out sideways, arms embracing the bole; straighten the knees, clasp the bole two feet higher up, draw up the knees, and so on, working up by a series of jerks.

Undisturbed forest consists of a few giants rather widely spaced, and large numbers of intermediate and smaller trees growing up in between. So, to collect a specimen from a giant, the climber looks for a small tree growing up beside it, and goes up it to get on to the upper part of the giant. Sometimes, several trees are used, the climber starting up a pole, transferring to a larger tree, thence to another, and so on to the giant.

If one tree is too far from the next, various devices are used to bridge the gap. If the first tree is small, the climber can bend it over towards the bigger one by his own weight, or pull it over by means of a length of cane he carries up for the purpose, one end of the cane being attached to the bole of the larger tree by a running loop; or the climber can make a giant hook out of a sapling with a cross-piece lashed to one end, carry it up with him to the top of his small tree, and, thence, hook the contraption over a branch of the giant, after which he lashes the butt end firmly with cane and, then climbs up the connecting link so formed.

These climbers have a wonderful sense of balance, but the climbing is sometimes so exposed and sensational that the botanist below can scarcely bear to watch.

In the years to come the professional botanists working out the Flora Malesiana, in the great herbaria of the world to which specimens are distributed, will see on the herbarium sheet only the name of the botanist who supervised the collecting and wrote the label. They will never know how much of the credit is due to those climbers who risk their necks day after day to bring down to earth the leaves and flowers and fruits of the jungle giants.

Burma

• The following remarks are taken from a radio talk by the Prime Minister U Nu:

" With the advent of the monsoon our farmers are busy preparing the plows and starting paddy cultivation which is the major occupation of our people. It seems to me that the rest of our people should also discharge a responsibility by taking advantage of the monsoon in the same way as the farmers discharge theirs.

This responsibility is no other than growing trees and plants in every village, every town and every available area. I am reminded of the fate of glorious Pagan which at one time was the jewel of Burma with magnificent pagodas, golden monasteries and stately homes and which was the center of our culture and civilization. Pagan flourished uninterrupted for over two hundred years after the reign of Anawrata the Great. At the end of that period the people of Pagan had to migrate, for various reasons, to other more fertile parts of the country. Among the causes of such mass migration, according to wise men, was deforestation. I subscribe to this point of view.

Scientists who are well aware of the inevitable consequences of deforestation, have been devising ways and means to prevent their occurrence. The United Nations Organization has been taking the lead in arousing public interest in tree-growing. Efforts are being made even to convert deserts into green lands.

It has been my personal experience that almost every country I have visited, irrespective of political and economic differences, is agreed on one thing: to grow more trees.

In Burma, too, the Government has taken a number of steps in the direction of reforestation. It can of course be said that at present there are no deserts in the country. But it is the considered view of experts that if only we neglect to reforest the dry zone in central Burma, it will one day turn into a vast desert land. It is a terrible contingency to think of. Besides, the vast stretches of hillsides are denuded of trees and forests, with the result that the rich soils are washed away with the rain water causing barren land. I understand that such lands, far from being suitable for cultivation, do not grow even grass for the cattle to graze on. Besides, due to indiscriminate cutting down of trees in the plains, both during the second world war and at present, the people's forests are getting more and more bare.

To arrest this process of deforestation, the Government drew up plans for reforestation in 1953-54, and steps are being taken to implement them. As a first step, measures are being taken to grow trees in the dry zone areas in central Burma. Measures are being taken to do away with cutting down trees on hillsides for the purpose of farming, and preserve fertile soils undisturbed. This project is in operation in the Naga Hills. The Shan States Government is also undertaking such measures in several areas. Under this plan, the old and obsolete custom of indiscriminate farming on hillsides is replaced by terraced farming. From the hill tops to the plains, trees and bamboos are being planted systematically.

There is still another plan to grow fruit trees and vegetables in all parts of the Union. Saplings were widely distributed to encourage cultivation. Coconut plantations have come into being, and steps are being taken to set up model farms in every district and State.

Two years have elapsed since these plans first operated, but it will not do to rely on the Government alone to prevent drought, erosion, flood and scarcity of fruits and vegetables.

Total success can be achieved only with the wholehearted co-operation of the people themselves. "

Canada

• One of the finest forestry research laboratories of its kind in the world has been built at the Petawawa Forest Experiment Station, near Chalk River, Ontario. Together with the adjoining administration building and staff house, it provides ample space and facilities for the research, administration, and accommodation needs of the forest experiment station, oldest and largest of the five forest research stations operated by the federal Forestry Branch.

The new laboratory contains complete and up-to-date equipment for research projects in tree physiology, experimental ecology, and forest fire prevention.

In addition, the federal forest research officers at Petawawa carry out tree-breeding and silvicultural programs. The tree-breeding program involves genetics, the study of forest trees, experimental planting to establish the adaptability to Canadian conditions of seeds of different provenances, the development of new pollination and grafting techniques, and efforts to bring about quicker flowering. The silvicultural program includes observation of the experimental cuttings established at the station during the past 30 years and introduction of an intensive management plan for 1,000 acres (405 hectares) of forest near the station headquarters. The silvicultural program is directed toward demonstrating what can be accomplished on the basis of present knowledge without too much concern for economic factors. Eventually, the Branch hopes to prove that these techniques are economically possible.

• Mr. Ormiston Roy of Montreal has brought to the attention of FAO a promising method which he has developed for growing and for packing single seedlings or transplants for shipment while retarding their growth, if necessary, for considerable periods prior to planting. At the request of FAO, a member of the Forestry Branch of the Department of Northern Affairs and National Resources visited Mr. Roy and technicians of the Montreal Botanic Gardens to study at first hand the methods used and results obtained. He reports as follows:

" Essentially the method is to pack plant roots in sphagnum moss or, if sphagnum moss is scarce, to pack in brown peat moss, similar to the way European roses and small shrubs are sold on the Canadian market.

The plant roots are placed on a piece of oilskin paper (vapor barrier paper) together with a handful of brown peat moss and rolled into a cylinder of one inch diameter. This cylinder is put into a 2-inch (5 centimeter) polyethylene tube and the bottom of the polyethylene tube is folded up along the cylinder to prevent spillage of the moss.

The oversize part of the polyethylene tube is folded with a sharp edge and fastened with a rubber band. The fact that the polyethylene tube is oversize compared with the plant-peat-moss-paper-tube facilitates easy " shaking-out ". The plants so packed are watered and kept for at least one year in a transplant-heel-in condition. When planting, the polyethylene tube is removed and the tree is planted with the moss.

Several species have been held this way in polyethylene tubes for up to five years. The plants were healthy but had a retarded growth — a characteristic which is valuable for nursery men as they can keep plants within the desired size for a longer period. The paper will eventually rot but the polyethylene tubes keep well for at least five years.

The plants during the transplant-heel-in stage can be watered with a nutrient solution. Success has been had with a " pancake " made by soaking sphagnum moss (and eventually squeezing it dry) in the following solution:

1 gallon (4.5 liters) water
1 tablespoon Rapid-Gro, } commercial
1 " Hyponex } products
2 teaspoon(s) gypsum lime
1 " hydrated lime
1/2 " magnesium sulphate (Epsom salt)
2 " easily soluble tree elements made up as follows:

H_3	BO_3	2.86 gram
Mn	Cl_2	1.81
Zn	SO_4	0.22
CU	SO_4	0.08
H_2	MO	0.02
H_2	O	1000.00

1/8 teaspoon iron.

For each bushel of squeezed sphagnum peat soaked in this solution, add a tablespoon prepared (fritted) trace elements, and one 3-inch (7.5-centimeter) pot of bone meal.

ECUADOR: *The main river artery of transportation, an FAO technical assistance officer reports, is the Rio Guayas and its tributaries. Rafts of logs are brought down river in voyages taking as much as 11 days. Sometimes logs too heavy to float by themselves are combined in rafts of balsa, and often the balsa rafts carry a deck load of farm products. Nearly all bamboo poles are transported by raft, as shown in the photograph. Two or three men can handle a large raft. The logs are relatively free, while in the water, from insect attack, and keep moist so they do not crack or split. Nearly all the sawmills in Guayaquil are located at the water's edge, and the logs can be stored in the rafts until it is time to cut them.*

In dry seasons, the reaches of the tributaries of the Rio Guayas do not have enough water to be navigable and, on the other hand, in times of heavy rains there is too much current and the rafts are hard to manage. Deliveries are not, therefore, regular. When river conditions are good, more rafts of logs reach Guayaquil than the mills can accommodate; when conditions are bad, especially toward the end of the dry season, the mills have a scarcity of logs.

Courtesy, S. von der Recke.

A mixture of about 1 part pancake to 10 parts moss would be adequate for use in packing of plants in polyethylene".

Suggested applications of Mr. Roy's method could be as follows:

1. Ordinary spring planting as the plants are definitely healthy and not root-pruned and have a low top-root ratio. The peat moss can be soaked with water and will give the plants a starting supply to enable them to become established more easily under arid conditions.
2. Summer planting — perhaps the most important potential use. The planting season can be extended.
3. The tubed plants could be very useful in public relation programs, with visitors to reforestation areas receiving tubed-plants all during the summer for immediate field planting.
4. Tubed plants could be used for bench grafting and perhaps for other types of research."

Interested readers may also wish to compare this with methods used by M. Clauzure as described in his article, "Utilisation des godets en polyéthylène pour les reboisements dans la région méditerranéenne" published in the *Revue forestière française.*

Finland

• For half a century Finland has been almost the only country producing birch plywood for the international timber market. According to the Finnish Foreign Trade Association, it is expected that the several decades to come will be characterized by the increasing appearance of spruce in Finland's forests, while the birch woods will grow smaller. This development is proceeding at so slow a pace that it can hardly be considered alarming from the viewpoint of the Finnish plywood industry — especially since with the intensification of silvicultural measures, the growth of good-quality birch has commanded ever greater attention.

Prior to the second world war there were 19 plywood factories in Finland; now their number is 23. Of 1953 output no less than 88 percent was shipped abroad, but during the past few years, marketing difficulties have resulted in lower production figures.

Great Britain has been the principal market for Finnish plywood, taking normally 50 percent of total exports.

France

• The development of the program of forest rehabilitation financed by the *Fonds forestier national* (National Forestry Fund) created in 1946, continues satisfactorily. By the end of 1955, 602,244 hectares of plantations had been established.

A new decree in 1957 has introduced a number of modifications in the methods of financing operations. Before, forest owners could obtain assistance for capital improvements in two ways, apart from outright grants:

1. long-term loans in cash at low interest rates, or
2. contracting with the *Administration des eaux et forêts* for the necessary work, the cost to be a first charge on receipts from future timber cuts, to a maximum of 50 percent thereof.

The contract method meant slow reimbursements to the National Forestry Fund but was preferred to loans by most forest owners because they in this way obtained the efficient technical help of the *Administration des eaux et forêts* without providing any particular security.

A new standard contract provides for repayment of the debt to the *Fonds forestier national* partly by annual instalments in cash, partly, as in the past, through a lien on future fellings. The proportions are assessed for each particular case, which permits more flexibility in operation of the fund. Should a forest owner fail to pay the annual instalments in cash as required, the debt in full falls due. It will bear interest at the legal rate and the lien on the returns from fellings can be raised to 100 percent.

• After 30 years devoted to research and 15 years as Director of the *Ecole nationale des eaux et forêts* and of the *Station de recherches et d'expériences forestières*, M. Auguste Oudin has retired.

In addition to his responsibilities as Director, M. Oudin assumed also those of Inspector-General in charge of all research and forestry education matters in France, as well as being a member of the Permanent Committee of the International Union of Forest Research Organizations and a President of the International Society of Soil Science. Although he spent the greater part of his time on liaison duties with government departments and research agencies, M. Oudin closely supervised the activities of the school.

The last work at Nancy with which M. Oudin was associated was the creation of new laboratories, and it was for this reason that the *Administration des eaux et forêts* combined the official leave-taking with the opening of these buildings. The

IRAQ: *Tree planting in Iraq is expanding vigorously under the current five-year plan. In the new irrigated desert plantations, hybrid poplars are widely planted along with plane and other species. The picture shows laborers at work in the Nineveh plantation near Mosul, planting one-year hybrid poplars. In the foreground, 8-foot (2.4 meter)* Robinia pseudacacia *nursery stock awaits planting.* Robinia *is often used as a border tree along rides and compartment boundaries.*

Courtesy, R. Baltaxe.

Director General of the *Administration des eaux et forets*, M. Merveilleux du Vignaux, made a farewell speech to M. Oudin, in which he praised his administration of the school, and his efforts to improve forestry research which now culminated in the building of the new laboratories.

M. René Rol has been nominated as Director at Nancy in succession to M. Oudin.

Hawaii

• A correspondent writes on the behavior of the different species of the genus *Eucalyptus* under Hawaii's numerous climatic conditions. Many of the species planted out 25 to 50 years ago have now reached a size sufficiently large to be harvested and manufactured into useful material. Some interesting information is being secured as the different species pass through the saw mill. Up to date, 15 different species have been given " mill run " tests, and the data being secured will be of value in future timber operations.

Among the outstanding species already tested are *Eucalyptus robusta*, *E. saligna*, *E. microcorys*, *E. deanei*, *E. citriodora*, *E. pilularis*, *E. gigantea*, *E. resenifera*, *E. rostrata*. *E. viminalis*, *E. sideroxylon* and *E. paniculata*. All of these species are considered good trees in their native habitat in Australia.

The rate of growth of some of the Eucalypts is phenomenal, perhaps due to the fact that Hawaiian plant quarantine law has kept out all of the pests which attack these trees in their native country. *E. saligna* is perhaps the most rapid-growing and seems to hold the record in Hawaii. *E. robusta* is a close second, and is a wonderful tree for the wet Hilo coast. Here, with rainfall in excess of 250 inches (6,350 millimeters) per year, it attains its best development. Trees of this species, 35 years old, are producing in the neighborhood of 60,000 board feet of wood per acre (850 cubic meters per hectare).

It has been suggested that a long range program to utilize what is now nonproductive land be given careful consideration by the Territory and other land owners. The area to raise these trees is available and it has been demonstrated that they do well here. The wood from several species of Eucalypts has already proved of value and is being used locally for several purposes including house construction. It appears possible that members of this genus may furnish the basis for a new minor industry in Hawaii.

ITALY: *Summer hats and handbags of " truciolo ", made from poplar wood at Carpi, in northern Italy.*

Courtesy, *Revue du Bois.*

India

• The Government is exploring the possibility of importing wooden sleepers from several foreign countries to bridge the existing serious gap between supply and demand. These countries include Burma, Australia, Thailand, Malaya and Indonesia. Despite the best efforts to obtain sleepers from Indian resources the total availability of wooden sleepers would cover only one third of the total requirements of the Indian railways. It is also proposed to use concrete sleepers and a beginning will be made in certain big railway yards to start with on an experimental basis.

In this connection it is estimated that India's total production of sawn timber is about 100 million cubic feet per annum (2,830,000 cubic meters). The total demand of the Indian railways is about 20 million cubic feet (566,000 cubic meters) but the difficulty arises from the fact that only a portion of the 100 million cubic feet can be used and made available to the railways due to limitation of sizes, quality and increasing demand of other industries.

Laos

• Arrangements have been made for the setting up of a Forestry Credit Fund for the purpose of providing the existing sawmills and wood-using industries with the capital required to improve and increase output.

It is financed from American economic aid and subsequently from the transfer of loans granted plus interest due.

Applications for loans are addressed to the Forest Service which examines them from the technical aspect. They are next submitted to an Administrative Commission and, if approved, returned to the Forest Service for implementation. All equipment supplied or monies granted are recognized as short-term loans repayable within a period of three years at an annual interest of 4 percent.

Morocco

• A group of small handicraftsmen, known as *madrieurs*, living in the Middle Atlas region, specialize in the working of the so-called native small timber (*madriers*). Although they usually work independently, a successful attempt was made some years ago to group them into co-operatives both for wood-working and for the sale of their products.

It is estimated that at present 400 of these craftsmen are grouped in co-operatives and it is expected that the movement will extend to 1,400 woodcutters and charcoal makers or a total of about 2,000 forest workers in all. The present trend is to induce these craftsmen, besides their speciality, to enter the wood-working industry in general.

New Caledonia

• Since 1947, a forestry officer has been assigned to New Caledonia. He has been able to make an initial inventory of forest species, undertake

Die Waldkrankheiten (FOREST DISEASES), F. Schwerdtfeger. 485 pp. Illus. 2nd edition P. Parey, Hamburg - Berlin. 1957. D.M. 39.40.

In this second edition of his textbook, Dr. Schwerdtfeger has expanded and revised a number of chapters. In fact, according to the author, hardly a page of the original (1944) edition has remained unaltered.

The title might more correctly be translated as "Forest Illnesses" because the book includes considerable information on damage due to fire, smoke, weather and soil as well as nematodes, arachnids, millepedes, insects, reptiles, birds and mammals, in addition to the disease-causing agencies such as viruses, bacteria and fungi.

There are brief general chapters on forest pathology and protection, susceptibility and resistance of forest trees, disease development and manifestations, relation to silviculture and management, and prevention and control. The 10-page summary of destructive agencies arranged according to tree species and symptoms is useful for finding specific items among the very detailed information given throughout the book.

Forest Fertilization. A bibliography, with abstracts, on the use of fertilizers and soil amendments in forestry, compiled by Donald P. White and Albert L. Leaf. 303 pp. State University College of Forestry, Syracuse University, New York. 1957.

Outside forest nurseries, fertilizers or soil amendments are used in forestry on a very small scale. Only liming in a few European countries is of any importance and, furthermore, impressive results have been obtained only on young plantations with soils leached by erosion or burnt over by fire. Much research has been conducted but there is still a vast field to explore and this publication should be of use to research workers interested in this question. It contains a list of scientific periodicals carrying articles on the application of fertilizers or soil amendments, and a bibliography continuing through the autumn of 1956, with brief abstracts of each book or paper, either written by the authors themselves or taken from specialized reviews.

In the preface, the writers explain how the choice of publications has been made. In the first place, they considered those publications which deal with research and observations carried out on the use of fertilizers or nutrient-containing materials to improve the growth or effect site amelioration for forestry purposes; secondly, publications were included on the use of fertilizers in forest-nursery management, and lastly for shade trees and landscaping, although in the latter field coverage is incomplete.

Finally, although it was difficult for them to set themselves a limit, the authors cite publications on the nutrition of forest trees in greenhouse and in pot culture.

Principales cultures du Congo belge. [CULTIVATION PRACTICES IN THE BELGIAN CONGO]. Marcel van den Abeele et René Vandenput. 923 pp. Illustrations in black and white and color. 3rd ed. *La Direction de l'agriculture, des forêts et de l'élevage.* Brussels. 1956. 200 B fr.

This book, of which the first edition appeared about six years ago, summarizes the development of agriculture in the Belgian Congo. The rapidity with which agricultural practices have evolved and plants or new varieties have been introduced, has necessitated the revision of the original work after this comparatively short interval.

The forester, especially the tropical forester, will certainly find most of the chapters in the book to be interesting. He will find species dealt with which are familiar to him, such as eucalypts or tannin-yielding acacias. They are included not by virtue of their timber-producing capacities but because they yield fruit, gums, tannin, and vegetable or essential oils. In other chapters, the forest, natural or restocked with appropriate species, is treated as playing an essential role in sheltering cultivated crops or protecting the arable soil.

In the Belgian Congo, there is no longer a precise dividing line between the agriculturist and the forester, and this undoubtedly begins to be true in all tropical countries and even in a large number of other regions. On the one side, the techniques used for the introduction of exotic tree species and the establishment of pure stands are largely borrowed from agriculture; and on the other, the protective role of either natural or artificial woodlands implies a kind of dual use of many areas. In their turn, many tree-crop plantations, which are of considerable economic importance in tropical regions, exercise a protective role in relation to soil and water complementary to that of the true forest.

Finally, it must be borne in mind that the forest fallow in tropical regions will remain an influential factor for a long time to come. More than in other regions, perhaps, there is a many-sided interrelationship between forestry and agriculture whose complexity is set out in the section entitled "General Considerations on Agriculture in the Belgian Congo" which forms the introduction to this book.

The Challenge of Our Watersheds. 167 pp. Soil Conservation Society of India, Bihar. 1957. Rs 15/-, $4.00, £1.5.0.

This is a collection of the papers issued in connection with the FAO Development Center on Watershed Management organized in India in 1957. It elaborates the official report (FAO Report No. 703) on this center which was designed as a digest of the major features of watershed management, with emphasis on the Far East.

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